Name	Date started	Target end date

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

Constructing and interpreting bar charts, line graphs, pie charts and frequency diagrams. Comparing distributions, drawing accurate pie chart sectors,

REVISE
.wales

3.18 — Bar charts, pie charts & line graphs

Spec 4.2.1, 4.2.2, 4.2.3 — Unit 3 (calculator allowed)

Constructing and interpreting bar charts, line graphs, pie charts and frequency diagrams. Comparing distributions, drawing accurate pie chart sectors, and reading information from charts to answer worded questions. 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: ~52 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (35 marks across 16 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).

Bar charts, pie charts & line graphs — what the new spec asks

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

Bar charts & line graphs 4.2.1

- Construct and interpret bar charts for discrete categorical data.
- Use dual / comparative bar charts to compare two groups.
- Draw line graphs for time-series data and read intermediate values.

Pie charts 4.2.2

- Sector angle $= \dfrac{\text{frequency}}{\text{total}} \times 360°$.
- Convert an angle back to a frequency by scaling by the total.
- Be careful comparing pie charts that represent different totals.

Frequency diagrams & comparison 4.2.3

- Read frequency diagrams (including frequency polygons) and pick out modal classes.
- Compare two distributions by referring to features such as spread, skew and modal class.
- Quote a total and use it to put proportional comparisons in context.

Crib sheet »

Bar charts, pie charts & line graphs in one page

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

Bar charts

Discrete categories on the horizontal axis, frequency on the vertical axis.

Bars have equal width and gaps between them (unless it's a histogram).

Label both axes; bars can be vertical or horizontal.

Dual / comparative bar charts

Two bars side by side for each category — one per group.

Use a key to distinguish the groups.

Great for comparing distributions across categories at a glance.

Line graphs

Used for *continuous* data, especially time series.

Plot points and join with straight lines; the line shows the trend between data points.

The values between plotted points are an estimate, not exact data.

Pie charts — angles

$$\text{angle} = \frac{\text{frequency}}{\text{total}} \times 360^\circ$$

All sector angles add to 360°.

Use a protractor for accurate drawing; label each sector with the category and/or percentage.

Pie charts — reading values

$$\text{frequency} = \frac{\text{angle}}{360^\circ} \times \text{total}$$

Measure the sector angle, then scale up by the known total.

If two pie charts represent different totals, equal angles do *not* mean equal frequencies.

Comparing pie charts

A bigger sector represents a bigger *proportion*, not necessarily a bigger frequency.

To compare actual numbers, scale each angle by its respective total.

State the total alongside the comparison.

Frequency polygons

Plot frequency against the *midpoint* of each class.

Join consecutive points with straight lines.

Good for comparing two distributions on the same axes.

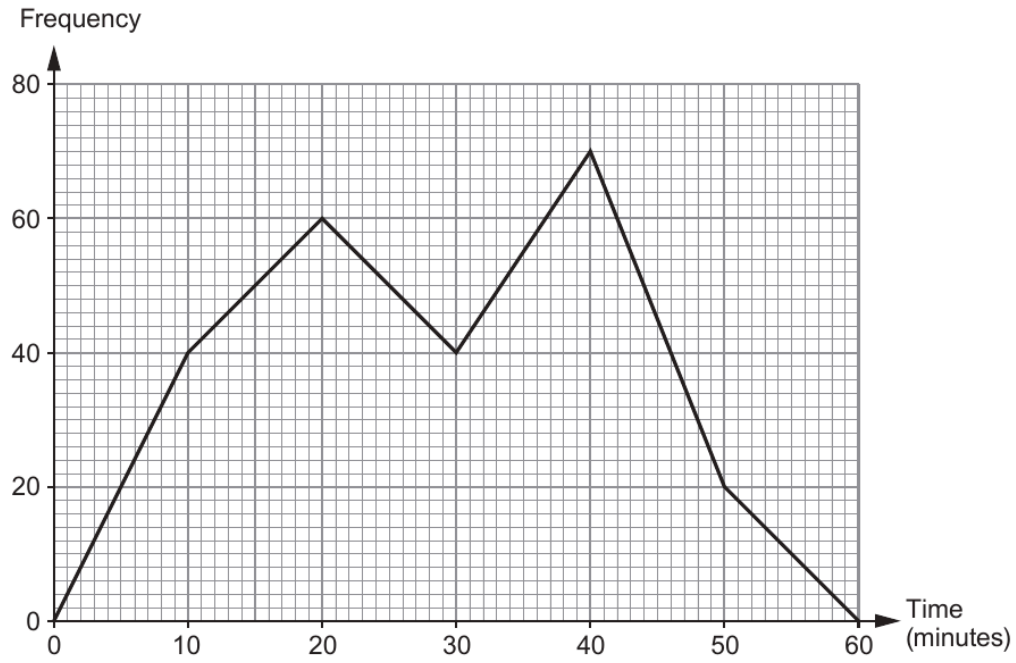
Common traps

- Pie chart angles not summing to 360° — cumulative arithmetic error.
- Comparing raw angles across two pies with different totals.
- Using a bar chart for continuous data (use a histogram instead).
- Forgetting to label axes / give the chart a title.

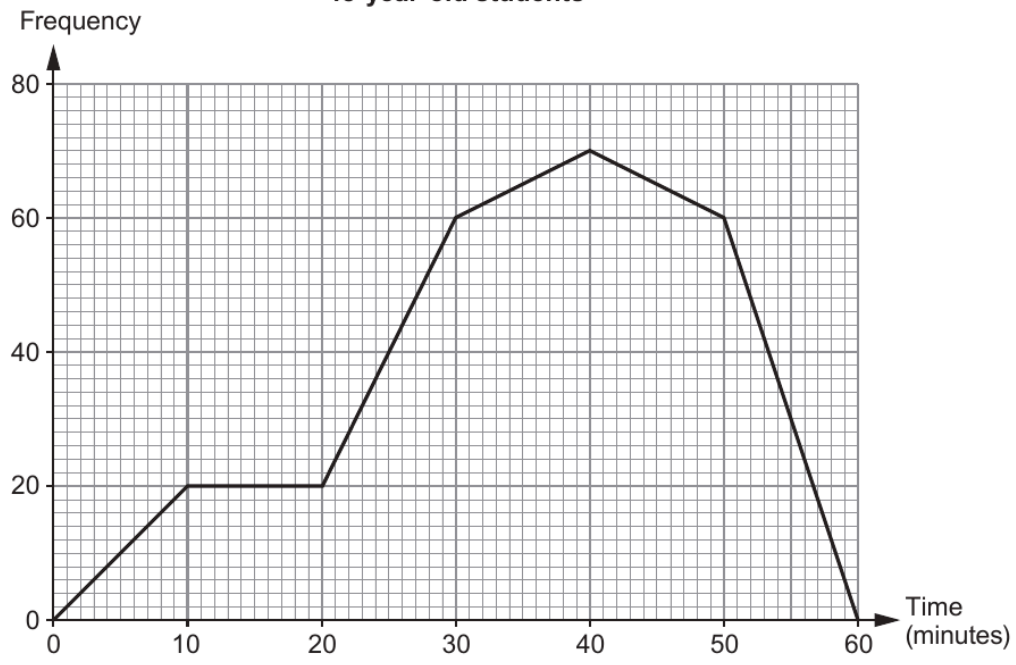
Examiner only

2. A survey was carried out to find how much time a group of 16-year-old students and a group of 18-year-old students spent using social media.
The frequency polygons below, which use equal time intervals, illustrate the results.

16-year-old students



18-year-old students



Examiner only

(a) How many 16-year-old students took part in the survey?
Circle your answer. [1]

60 70 210 230 2300

(b) How many more 16-year-old students than 18-year-old students spent between 15 minutes and 25 minutes using social media?
Circle your answer. [1]

20 40 60 100 250

(c) Wesley says,

'The 16-year-old students generally spent about the same time using social media as the 18-year-old students.'

Using the frequency polygons, how would you explain to Wesley that his statement is not true? [1]

Examiner only

3. *(a)* Expand and simplify the following expression. [4]

$$x(5x - 2) - 3(x^2 - 2x + 7)$$

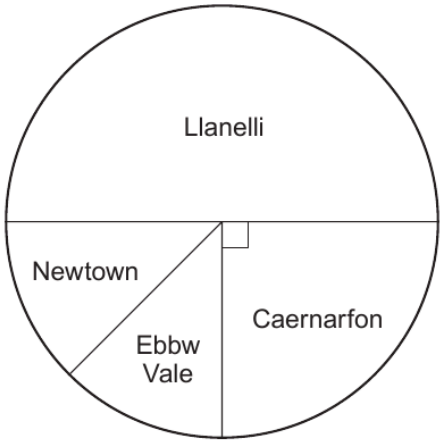
(b) Solve $\frac{22 - f}{3} = 6$. [3]

4. *(a)* A fair, six-sided dice is thrown twice.
What is the probability that a 3 is thrown on both occasions? [2]

Examiner only

(b) A company has offices in Llanelli, Caernarfon, Newtown and Ebbw Vale.
Its national committee is made up of workers from these four offices.

The pie chart below shows what fraction of the committee members come from each office.



There is an equal number of members from Newtown and Ebbw Vale.

A member is chosen at random from this committee to be its chairperson.

(i) The probability that the chosen member works at the Llanelli office is shown in the table below.

Complete the table. [2]

Office	Llanelli	Caernarfon	Newtown	Ebbw Vale
Probability	$\frac{1}{2}$			

(ii) What is the probability that the member chosen as chairperson works at either the Llanelli or the Ebbw Vale office?
You must show all your working. [2]

Examiner only

12. *(a)* Expand and simplify the following expression. [4]

$$x(5x - 2) - 3(x^2 - 2x + 7)$$

(b) Solve $\frac{22 - f}{3} = 6$. [3]

13. *(a)* A fair, six-sided dice is thrown twice.
What is the probability that a 3 is thrown on both occasions? [2]

Examiner only

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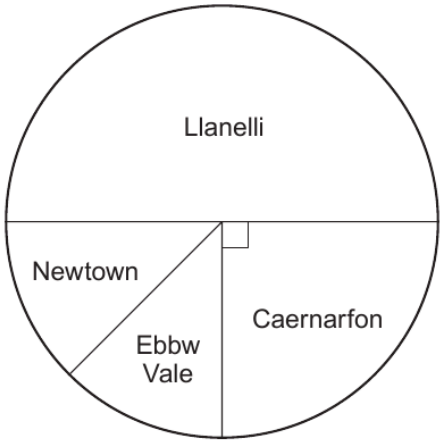


There is an equal number of members from Newtown and Ebbw Vale.

A member is chosen at random from this committee to be its chairperson.

(i) The probability that the chosen member works at the Llanelli office is shown in the table below.

Complete the table. [2]

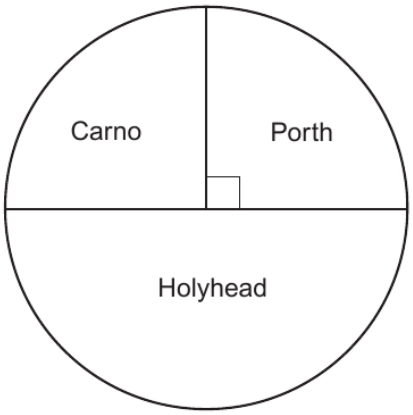
Office	Llanelli	Caernarfon	Newtown	Ebbw Vale
Probability	$\frac{1}{2}$			

(ii) What is the probability that the member chosen as chairperson works at either the Llanelli or the Ebbw Vale office?
You must show all your working. [2]

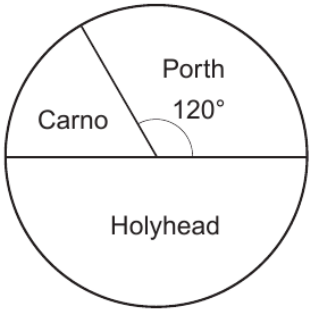
Examiner only

5. A company has 3 sites based in Wales.
One is in Carno, one is in Holyhead and one is in Porth.

The pie charts below show the distribution of its 128 female staff and 72 male staff.



128 female staff



72 male staff

A person is chosen at random from the company's 200 staff members.
What is the probability that this person works at the Porth site? [4]

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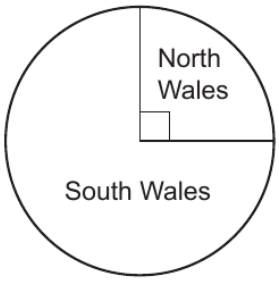
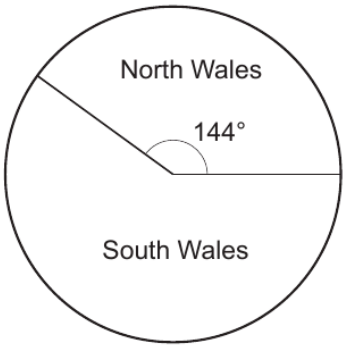
Examiner only

2. A company has two sites.
One is in North Wales and the other is in South Wales.

The pie charts below show the distribution of its 96 part-time staff and its 150 full-time staff.



96 part-time staff

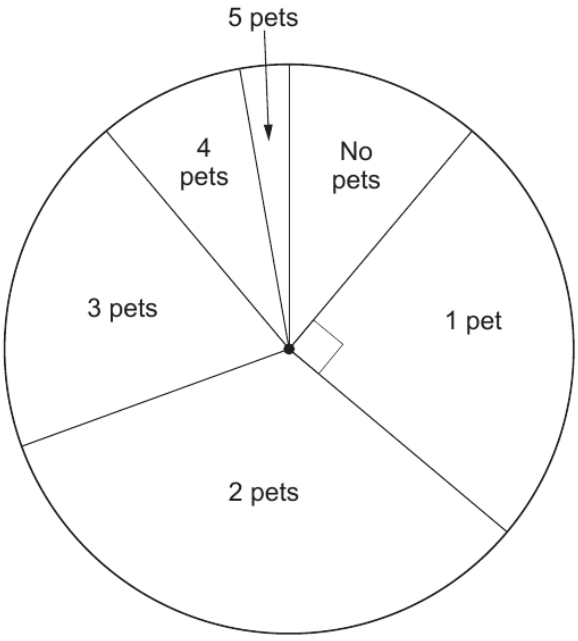


150 full-time staff

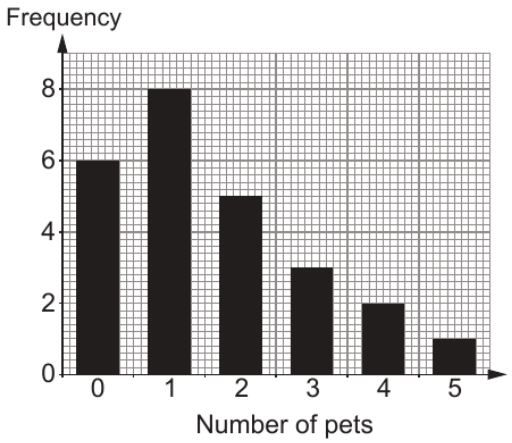
A person is chosen at random from the company's 246 staff members.
What is the probability that this person works at the site in North Wales? [4]

Examiner only

3. The children in year 5 and year 6 in a primary school took part in a survey.
The children were asked, "How many pets do you have?"
The results are shown in the pie chart and bar chart below.
No child in either year had more than 5 pets.



Year 5



Year 6

There are 36 children in year 5.

One child is chosen at random from all the children in year 5 and year 6.
What is the probability that this child has no more than 1 pet? [6]

Examiner only

1. (a) The Royal National Lifeboat Institution (RNLI) bought a new lifeboat.

The lifeboat was funded as follows:

- 2% from government sources
- 94% from donations
- 4% from other sources.

The new lifeboat cost £2.2 million.

How much of the cost of this lifeboat was funded from government sources?
Write your answer in figures only. [3]

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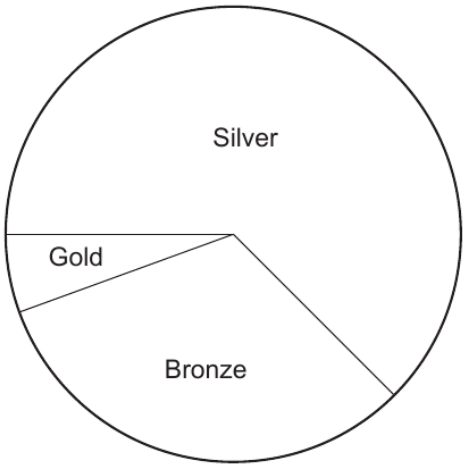
Examiner only

(b) 1800 medals were awarded to RNLI crew members in recent years.
The distribution of the medals is shown accurately in the pie chart below.



Lifeboats

(i) What fraction of the medals awarded were bronze?
Circle your answer. [1]

$\frac{135}{360}$ $\frac{245}{360}$ $\frac{65}{360}$ $\frac{115}{360}$ $\frac{75}{360}$

(ii) How many gold medals were awarded?
You must show all your working. [3]

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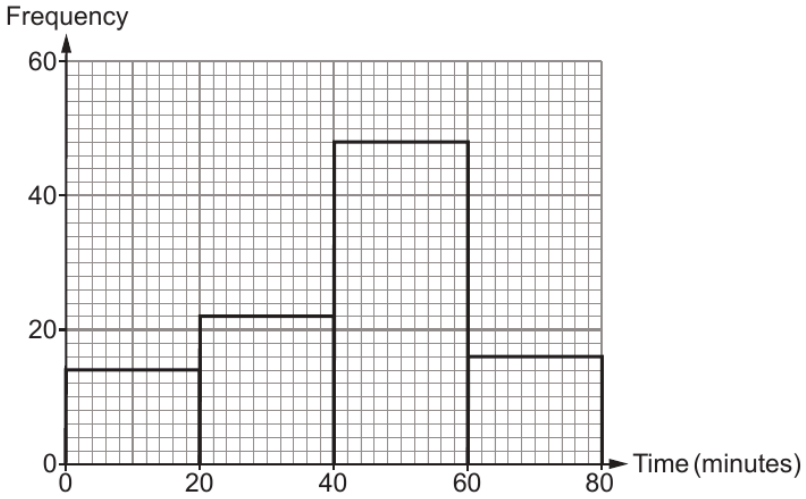
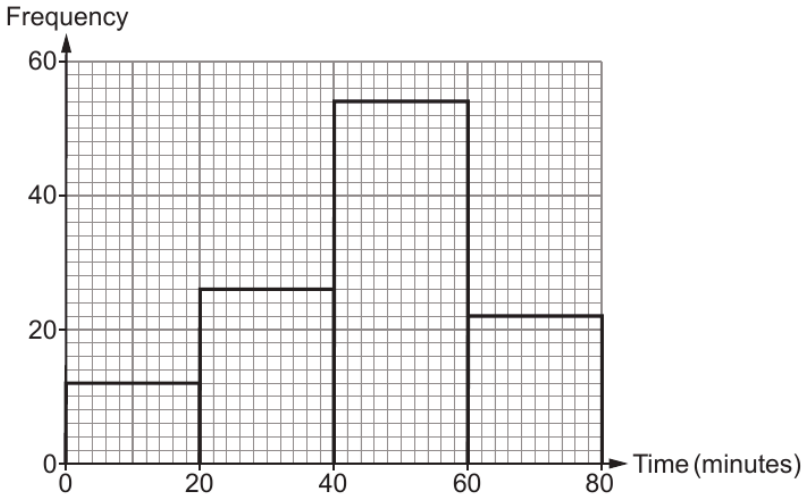
3. The frequency diagrams below show the lengths of time that men and women spent training in the gym on Friday.

Time spent training – Men



Time spent training – Women



Examiner only

(a) Freddie says he spent exactly 1 hour 25 minutes training in the gym on Friday.
Explain how you know that Freddie is not telling the truth. [1]

(b) How many men spent less than 20 minutes training in the gym on Friday?
Circle your answer. [1]

12 14 54 6 20

(c) How many women spent less than 40 minutes training in the gym on Friday?
Circle your answer. [1]

14 26 34 38 76

(d) Gwen says,

"A greater **proportion** of women than men spent between 40 and 60 minutes training in the gym on Friday."

Is Gwen's statement true or false?

True ☐ False ☐

You must show all your working to support your answer. [5]

Examiner only

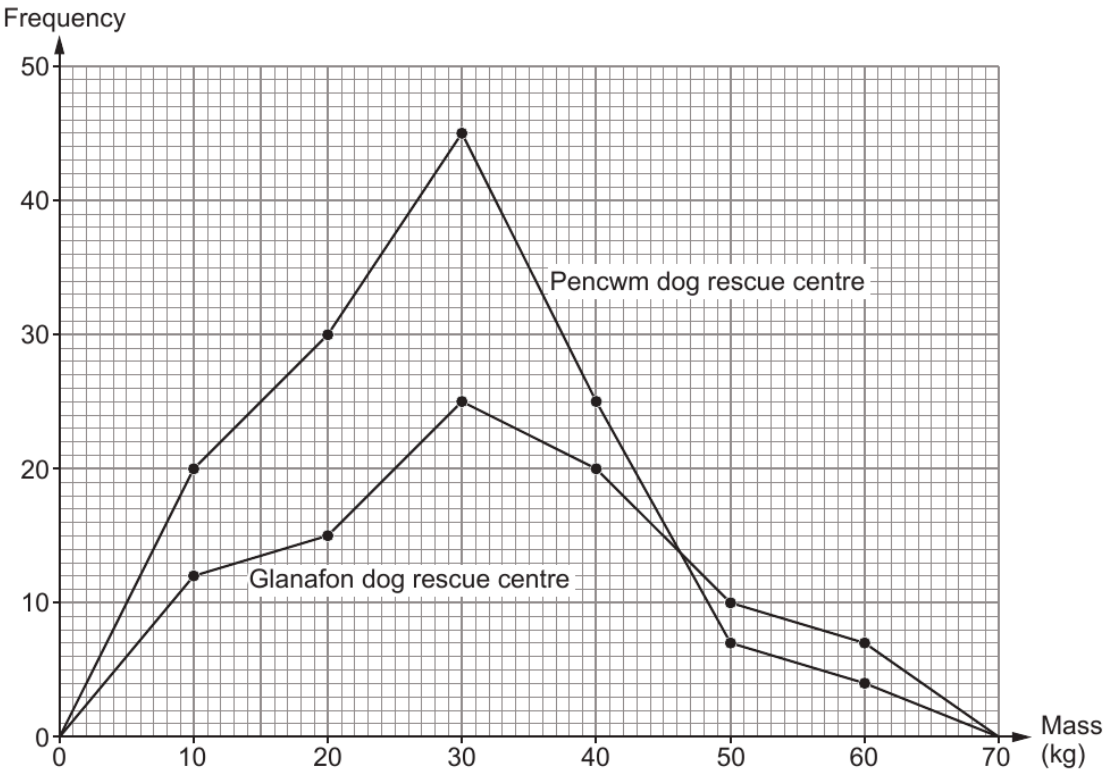
2. Glanafon and Pencwm dog rescue centres take in unwanted dogs.

The mass of each dog in the two dog rescue centres was recorded.

Groups of width 10 kg were used:

$5\,\text{kg} \leqslant \text{mass} < 15\,\text{kg}, \quad 15\,\text{kg} \leqslant \text{mass} < 25\,\text{kg}, \quad \ldots, \quad 55\,\text{kg} \leqslant \text{mass} < 65\,\text{kg}$

The results are shown in the frequency polygons below.



(a) Doreen, Rory and Muzhir look at these frequency polygons.

(i) Doreen says,

"The modal group of the masses of dogs in each dog rescue centre is the same."

Is Doreen correct?

Yes ☐ No ☐ Can't tell ☐

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

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Examiner only

(ii) Rory says,
"28 of the dogs in Pencwm each have a mass of 18 kg."

Is Rory correct?

Yes ☐ No ☐ Can't tell ☐

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

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(iii) Muzhir says,
"There is a higher proportion of dogs that are heavier than 35 kg in Glanafon than in Pencwm."

Without doing any calculations, decide if Muzhir is correct.

Correct ☐ Incorrect ☐ Can't tell ☐

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

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(b) The estimate of the mean mass of the dogs in Glanafon was 32·5 kg.
How much less was the estimate of the mean mass of the dogs in Pencwm?
You must show all your working. [5]

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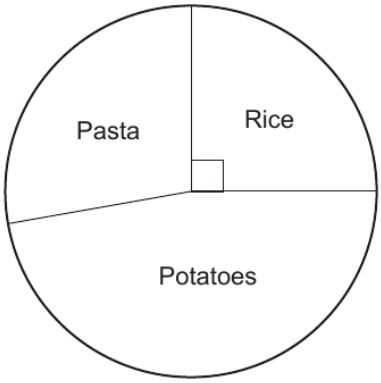
Estimate of the mean mass of the dogs in Pencwm is ..... kg less than in Glanafon.

Examiner only

2. In a survey, 540 people were asked if they preferred pasta, rice or potatoes.
They were asked to choose just one preference.
The results are displayed in the accurately-drawn pie chart below.



(a) How many people preferred rice? [2]

..... people

(b) The sector for potatoes on the pie chart is to be split.
40% of the people who chose potatoes said they preferred chips.

What will be the size of the angle in the sector for **chips**?
You must show all your working. [3]

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(c) 540 people took part in the survey. $\frac{7}{10}$ of these people were children..
How many people who took part in the survey were **not** children? [2]

Number of people who were **not** children .....

Examiner only

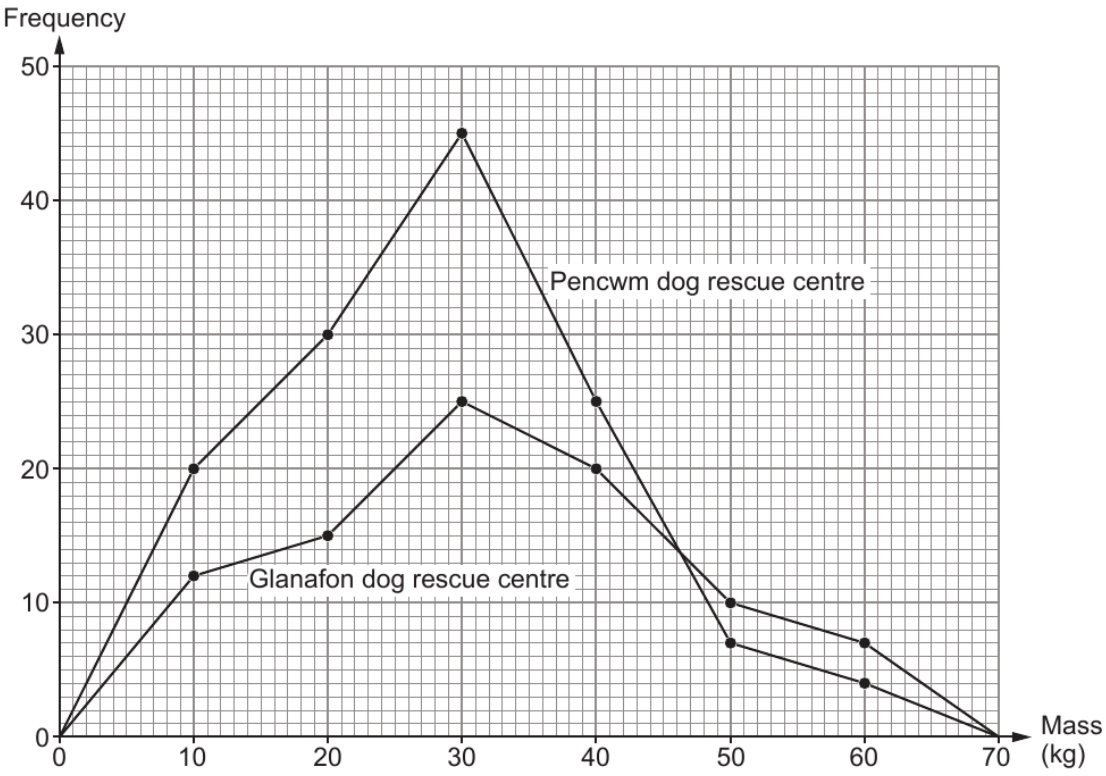
6. Glanafon and Pencwm dog rescue centres take in unwanted dogs.

The mass of each dog in the two dog rescue centres was recorded.

Groups of width 10 kg were used:

$5\,\text{kg} \leqslant \text{mass} < 15\,\text{kg}, \quad 15\,\text{kg} \leqslant \text{mass} < 25\,\text{kg}, \quad \ldots, \quad 55\,\text{kg} \leqslant \text{mass} < 65\,\text{kg}$

The results are shown in the frequency polygons below.



(a) Doreen, Rory and Muzhir look at these frequency polygons.

(i) Doreen says,

"The modal group of the masses of dogs in each dog rescue centre is the same."

Is Doreen correct?

Yes ☐ No ☐ Can't tell ☐

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

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Examiner only

(ii) Rory says,

"28 of the dogs in Pencwm each have a mass of 18 kg."

Is Rory correct?

Yes ☐ No ☐ Can't tell ☐

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

.....

.....

.....

(iii) Muzhir says,

"There is a higher proportion of dogs that are heavier than 35 kg in Glanafon than in Pencwm."

Without doing any calculations, decide if Muzhir is correct.

Correct ☐ Incorrect ☐ Can't tell ☐

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

.....

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(b) The estimate of the mean mass of the dogs in Glanafon was 32·5 kg.
How much less was the estimate of the mean mass of the dogs in Pencwm?
You must show all your working. [5]

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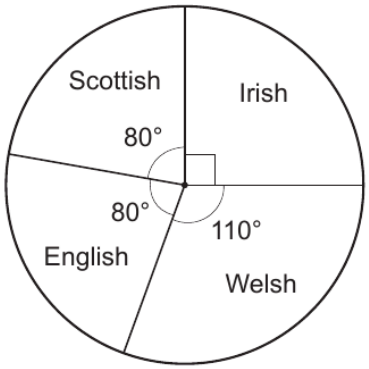
Estimate of the mean mass of the dogs in Pencwm is ..... kg less than in Glanafon.

Examiner only

4. (a) 7200 spectators at a sports event were asked their nationality.
The results are displayed in the pie chart below.



(i) One third of the Irish spectators were female.
How many female Irish spectators were at the event? [3]

(ii) For the Welsh spectators, the ratio of the number of adults to the number of children was 6 : 5.
How many adult Welsh spectators were at the event?
You must show all your working. [4]

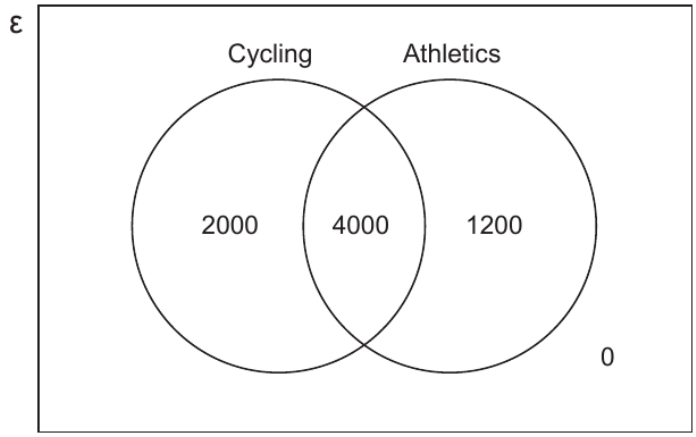
Examiner only

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

The 7200 spectators watched cycling, athletics, or both.
The entrance fees for the events were as follows.

Events	Entrance fee
Cycling only	£25
Athletics only	£30
Joint entry to both cycling and athletics	£40

The Venn diagram shows the number of tickets bought for the different events.



Calculate the total amount taken in entrance fees from the 7200 spectators.
You must show all your working. [3 + 2 OCW]

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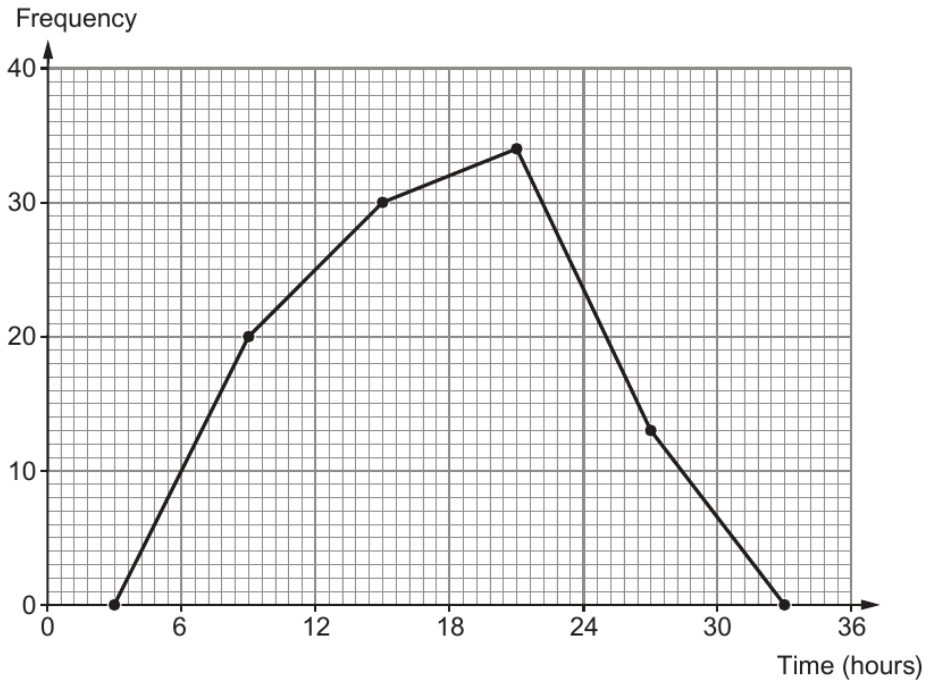
Examiner only

6. (a) A survey was carried out to find the total time people took to read the book 'Wales is a Celtic Country'.
The results are shown in the frequency polygon below.



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

18 to 24 hours 21 hours 12 to 18 hours 34 hours 30 to 36 hours

(ii) How many people took part in the survey?
Circle your answer. [1]

34 30 33 97 108

.....

.....

Examiner only

(iii) How many of the people in the survey took 24 hours or more to read this book? Circle your answer. [1]

13 34 47 24 84

(iv) Did any of the people in the survey take less than 6 hours to read this book?

Yes ☐ No ☐ Can't tell ☐

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

(b) Four books are placed in a stack.

The thickness of each of the books is as follows:

22 mm 25 mm 29 mm 31 mm

The thickness of each book is measured **correct to the nearest mm**.

Show that the total height of the stack of these four books cannot be more than 109 mm. [3]

Examiner only

10. The employees of a company belong to one of three departments: *Management (M)*, *Sales (S)* or *Distribution (D)*.

The diagram below is a sketch of a pie chart.
The diagram shows the proportion of employees working in each of these departments.

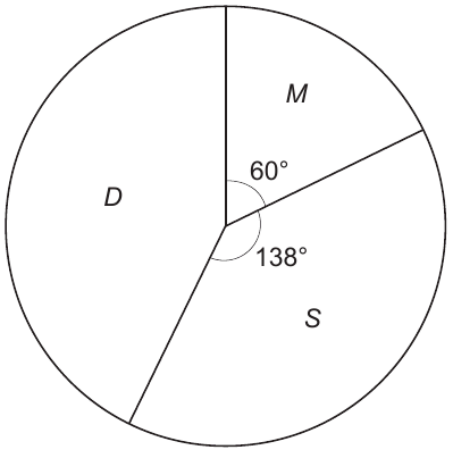


Diagram not drawn to scale

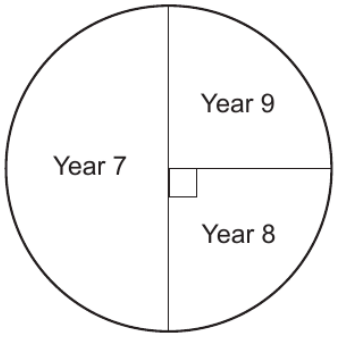
An employee is chosen at random.
Calculate the probability that this employee works in the *Distribution* department.
Give your answer as a decimal. [3]

Examiner only

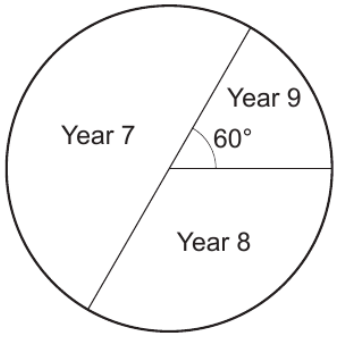
2. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

The pie charts show the distributions of Year 7, Year 8 and Year 9 pupils in two schools, Ysgol Afon and Ysgol Twyn.

Ysgol Afon



Ysgol Twyn



There are 254 **Year 7** pupils in Ysgol Afon.
The **total** number of pupils in Year 7, Year 8 and Year 9 in Ysgol Twyn is 480.

One pupil is chosen at random from all the Year 7, Year 8 and Year 9 pupils in these two schools.
What is the probability that this pupil is in Year 9? [5 + 2 OCW]

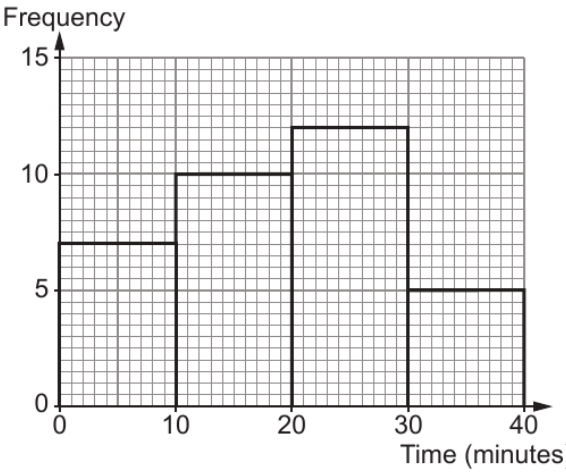
Examiner only

4. Miss Hughes asked her class of Year 9 pupils and her class of Year 10 pupils how many minutes they each spent on their mathematics homework last weekend.

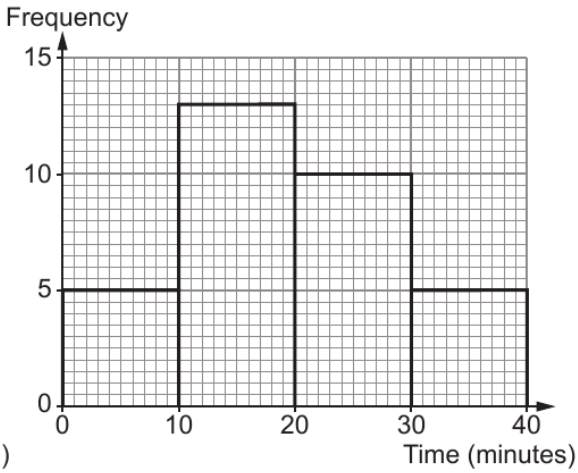
The frequency diagrams below show the results.
The groups used are as follows:

$0 \leqslant \text{time} < 10, \quad 10 \leqslant \text{time} < 20, \quad 20 \leqslant \text{time} < 30 \quad \text{and} \quad 30 \leqslant \text{time} < 40.$

Year 9



Year 10



(a) What is the modal group of the times for the Year 9 pupils? [1]

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(b) How many of the Year 10 pupils spent 20 minutes or more on their mathematics homework last weekend? [1]

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(c) Did any of the Year 10 pupils spend **no** time on their mathematics homework last weekend?

Yes ☐ No ☐ Can't tell ☐

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

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