Name	Date started	Target end date

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

Bearings (three-figure angles measured clockwise from North), reading maps and scale drawings, and converting between map and real distances using a s

REVISE
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2.15 — Maps, scale drawings & bearings

Spec 3.3.1, 3.3.2, 3.3.3, 3.3.4 — Unit 3 (calculator allowed)

Bearings (three-figure angles measured clockwise from North), reading maps and scale drawings, and converting between map and real distances using a stated scale. Sourced from legacy WJEC GCSE Mathematics / Mathematics–Numeracy Higher non-calculator papers, organised for revision under the 2025 spec.

2025 SPECIFICATION

Estimated time for entire question pack: ~1 hours 30 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (60 marks across 13 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).

Maps, scale drawings & bearings — what the new spec asks

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

Bearings 3.3.1

- Three figures, clockwise from North.
- Draw a dashed North line at the start point.
- Measure with a protractor — turn clockwise from North.
- Back bearing = forward bearing $\pm 180^\circ$.

Scale notation 3.3.2

- $1 : n$ means $1\,\text{cm}$ on the map equals $n\,\text{cm}$ in real life.
- Convert into m or km at the end — not mid-calculation.
- Check the units the question asks for.

Map ↔ real distance 3.3.3

- Map to real: multiply by the scale factor.
- Real to map: divide by the scale factor.
- Keep both quantities in the same units before multiplying or dividing.

Scale drawings 3.3.4

- Choose a scale that fits the page comfortably.
- Convert every measurement using the chosen scale.
- State the scale on your drawing.
- Use a sharp pencil, ruler and protractor.

Crib sheet »

Maps, scale drawings & bearings in one page

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

How bearings work

3-figure clockwise from North

Always written with three digits: 045°, not 45°.

000° N, 090° E, 180° S, 270° W.

Measuring a bearing

Draw a North line (dashed, pointing up) at the starting point.

Turn *clockwise* from North to the line of sight to the destination.

That angle, in degrees, is the bearing — written as a three-figure number.

Back bearing

bearing B from $A + 180^\circ$ = bearing A from B

If the result is more than 360°, subtract 360°.

E.g. bearing of B from A is $075^\circ \Rightarrow$ back bearing is $075^\circ + 180^\circ = 255^\circ$.

Scale notation

A scale of $1 : 50\,000$ means $1\,\text{cm}$ on the map $= 50\,000\,\text{cm} = 500\,\text{m} = 0.5\,\text{km}$ in real life.

Or written as '$1\,\text{cm}$ represents $2\,\text{km}$'.

Map to real distance

Measure on the map with a ruler, then multiply by the scale.

$1 : 50\,000$, ruler reads $4.2\,\text{cm}$: real distance $= 4.2 \times 50\,000\,\text{cm} = 210\,000\,\text{cm} = 2.1\,\text{km}$.

Real distance to map

Divide the real distance by the scale.

$1 : 25\,000$, real distance $1.5\,\text{km} = 150\,000\,\text{cm}$: map distance $= 150\,000 / 25\,000 = 6\,\text{cm}$.

Scale drawings

Pick a scale that fits the page — e.g. '$1\,\text{cm}$ represents $2\,\text{m}$' for a $10\,\text{m} \times 8\,\text{m}$ room.

Convert every real measurement using the scale, then draw with a ruler and protractor.

State the scale clearly on your drawing.

Common traps

- Writing a 2-digit bearing — always use three digits.
- Forgetting to add or subtract 180° for a back bearing.
- Mixing cm and m when converting with the scale.
- Measuring anticlockwise from North.

Examiner only

6. The diagram below shows the locations of the ports of Lindat, Molk and Nuir.
Lindat is due south of Nuir, and Nuir is due west of Molk.

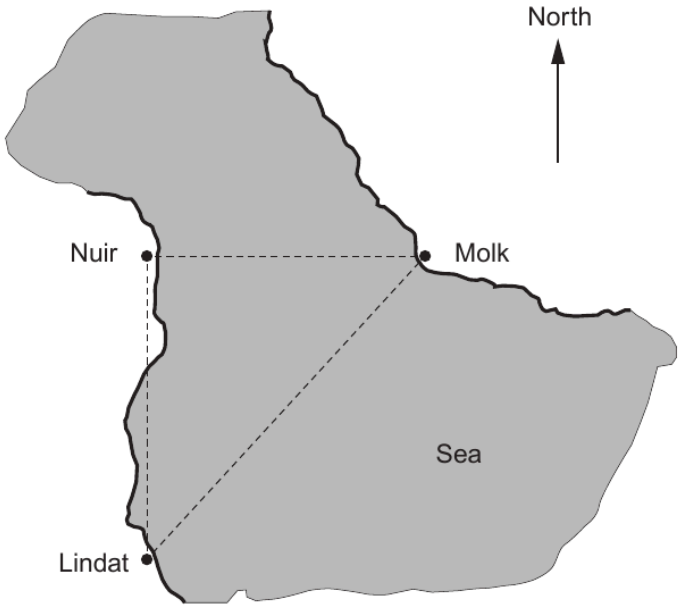

Diagram not drawn to scale

Agnetha lives in Molk.
She travels from Molk to Lindat by ship.

- Lindat is 24 km due south of Nuir.
- The ship sails directly to Lindat on a bearing of 211°.
- The ship has an average speed of 20 km/h.
- The ship leaves at 11:45 a.m.

Calculate Agnetha's arrival time in Lindat. [7]

Examiner only

1. *(a)* Calculate $\dfrac{145{\cdot}3}{(12{\cdot}4 - 9{\cdot}8)^3}$, giving your answer correct to 3 significant figures. [2]

(b) Calculate the reciprocal of 47, giving your answer correct to 4 decimal places. [2]

2. Circle the correct answer in each of the following.

(a) Which of the following values **cannot** be an external angle of a regular polygon? [1]

10° 18° 30° 48° 72°

(b) An arrow on a spinner is facing north.
It is turned clockwise through an angle of 1530°.
In which direction will the arrow now be facing? [1]

North East South West None of these

(c) Point *A* is on a bearing of 100° from point *B*.
What is the bearing of point *B* from point *A*? [1]

260° 100° 280° 180° 80°

Examiner only

3. Sara is carrying out a survey of the three villages, Cwm, Allthir and Gwyndir.
The diagram below shows the positions of the three villages.

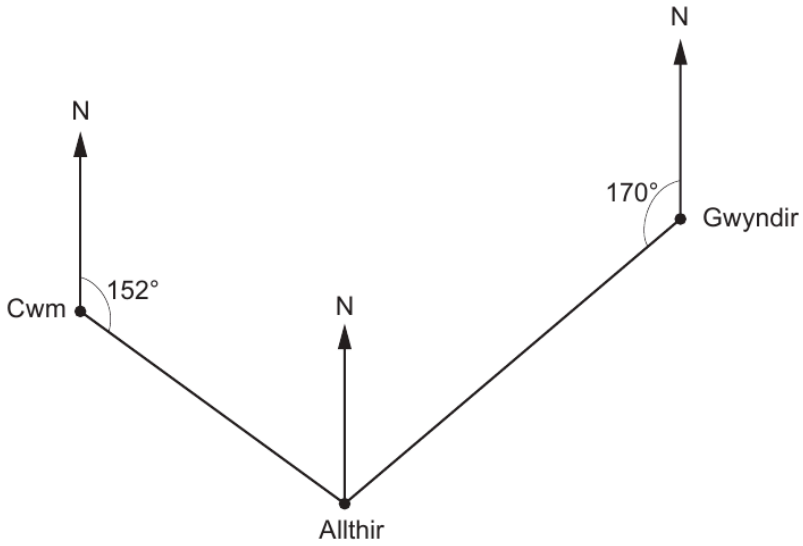

Diagram not drawn to scale

(a) What is the bearing of Allthir from Gwyndir?
Circle your answer. [1]

010° 170° 180° 190° 200°

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(b) What is the bearing of Cwm from Allthir?
Circle your answer. [1]

028° 152° 242° 332° 352°

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Examiner only

(c) The area of the land covered by the three villages is 200 km^2.
The total population of the three villages is 8400 people.

(i) What is the population density of the three villages?
Give your answer in population/km^2. [2]

(ii) The populations of Cwm, Allthir and Gwyndir are in the ratio 3 : 4 : 5.
Calculate the population of Gwyndir. [2]

Examiner only

1. *(a)* Mold is on a bearing of 065° from Ruthin.
What is the bearing of Ruthin from Mold?
Circle your answer. [1]

245° 095° 295° 125° 315°

(b) When it is 19:40 in Cardiff, it is 23:40 in Dubai.

(i) What time is it in Dubai when it is 13:30 in Cardiff?
Circle your answer. [1]

15:30 10:30 09:30 17:30 19:30

(ii) What time is it in Cardiff when it is 02:10 in Dubai?
Circle your answer. [1]

20:10 06:10 22:10 10:10 00:10

Examiner only

5. The picture shows a mountain hut.
The hut
- stands on a rectangular base,
- has a uniform cross-section.

(a) Draw a sketch of the plan view of the mountain hut. [1]

(b) This mountain hut is shown on a map.
The scale of the map is 1 : 50 000.
On the map the mountain hut is 4·2 cm from a farmhouse.
How far away is the hut from the farmhouse?
Give your answer in km. [3]

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Distance is ..... km

Examiner only

(c) The map below shows the placement of four wind turbines, and a road connecting two of the turbines.

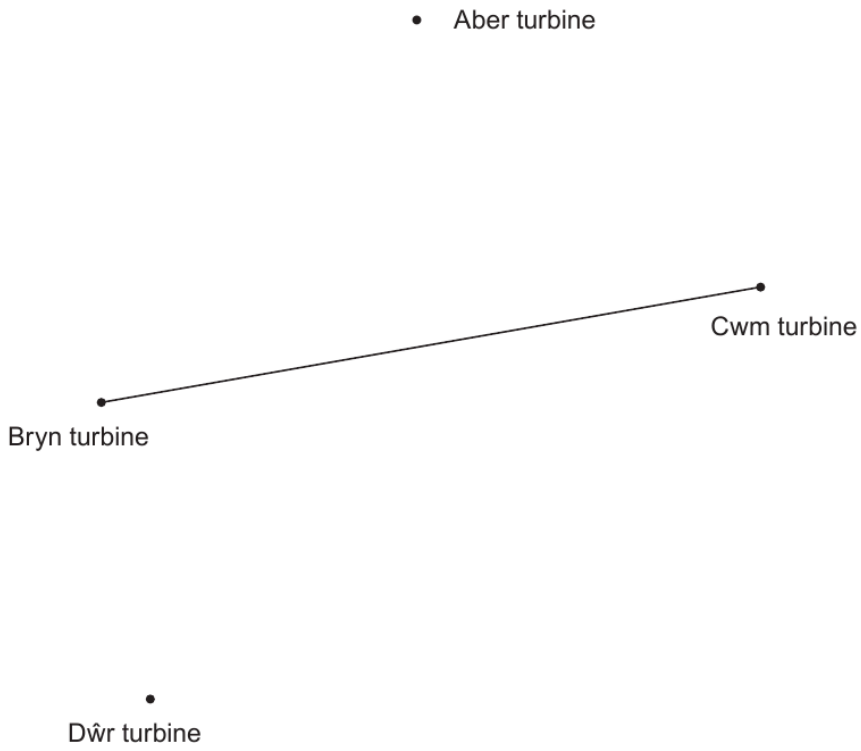
A new wind turbine, Efail, is to be built.
It is to be placed

- on the road connecting Bryn turbine and Cwm turbine, and
- on the perpendicular from Aber turbine to the road.

The map is drawn using a scale of **2 cm represents 1 km**.

How far will Efail turbine be from Dŵr turbine?
You **must** use constructions to answer this question, using **only a pair of compasses and a ruler**. [4]

Scale 2 cm represents 1 km



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Distance is ..... km

Examiner only

8. Heledd is the captain of a cargo ship. She is planning her next voyage.

(a) Heledd has been employed to deliver 3×10^5 tonnes of sand.

Heledd needs to know the volume of the sand before the sand can be loaded on to the ship.
She has been given the following information about the sand:

Mass of a grain of sand	Volume of a grain of sand
$1{\cdot}2 \times 10^{-3}$ grams	$0{\cdot}32\,\text{mm}^3$

(i) Calculate the number of grains of sand in 3×10^5 tonnes of sand.
Give your answer in standard form. [3]

(ii) Calculate the volume of the 3×10^5 tonnes of sand in $\mathbf{m^3}$. [3]

..... m^3

Examiner only

(b) Heledd has been given the following instructions for her voyage:

- From port *A*, sail 200 km due south to port *B*.
- From port *B*, sail due east to port *C*.
- From port *C*, sail on a bearing of 318° back to port *A*.

Use the space below to draw a sketch of the ship's voyage.

Calculate the distance from port *C* directly back to port *A*. [4]

Examiner only

(c) The last time the cargo ship was unloading sand in port *B*, it took 3 cranes 45 hours to unload 250 000 tonnes of sand.

Port *B* now has 5 cranes.
Calculate the time it will take 5 cranes to unload 300 000 tonnes of sand.

You can assume that all cranes unload sand at the same rate, and that all other conditions remain the same.

Give your answer in **hours** and **minutes**.
You must show all your working.

[4]

Time it will take is ..... hours and ..... minutes

Examiner only

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

Is it possible to draw a **right-angled** triangle with the measurements shown below?
You must use calculations (not a scale drawing) to support your answer.
You must show all your working. [4 + 2 OCW]

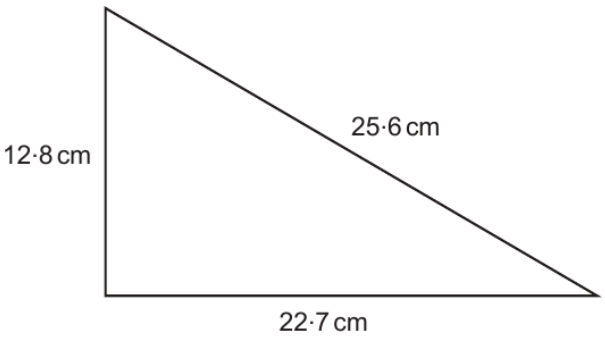


Diagram not drawn to scale

Examiner only

1. A rectangle has sides of length $2(3a - 7)$ cm and $(5a + 4)$ cm.

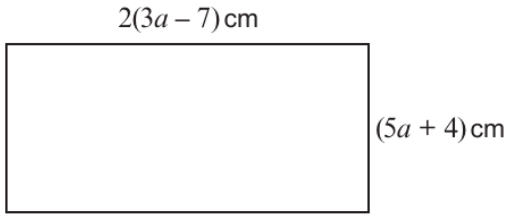


Diagram not drawn to scale

Form an expression, in terms of a, for the perimeter of this rectangle.
You must simplify your expression. [3]

Examiner only

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

Diagram not drawn to scale

ABC is a straight road, where the ratio *AB* : *BC* = 3 : 4.
AC = 56 km.

Calculate the length of *BC*.
Give your answer in **miles**.
You must show all your working. [4 + 2 OCW]

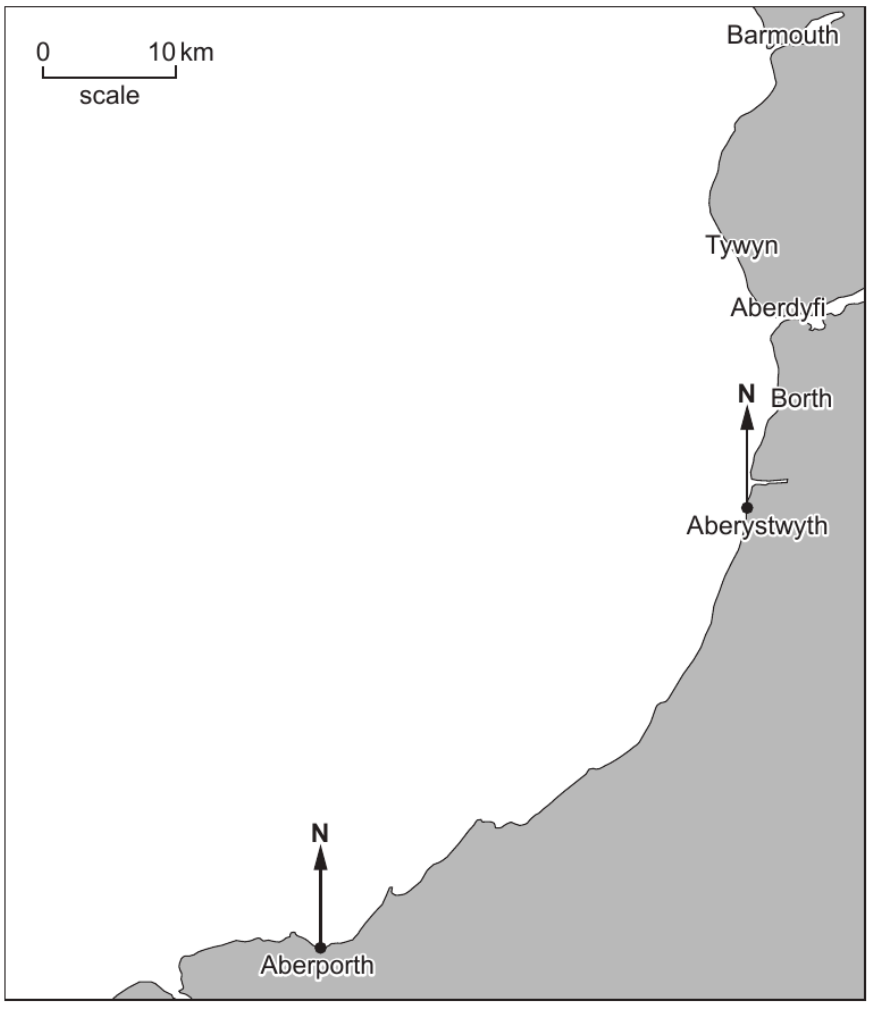
Length of *BC* = ... **miles**

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

8. Two cruise ships, The Explorer and The Magellan, leave the same port at 06:30.
The Explorer sails at a speed of 30 km/h on a bearing of 051°.
The Magellan sails at a speed of 35 km/h.
The angle between the courses of the two ships when they set sail is 49°.

(a) At 11:00, The Magellan comes to a stop due to engine failure.
The diagram below shows the positions of the two ships at 11:00.

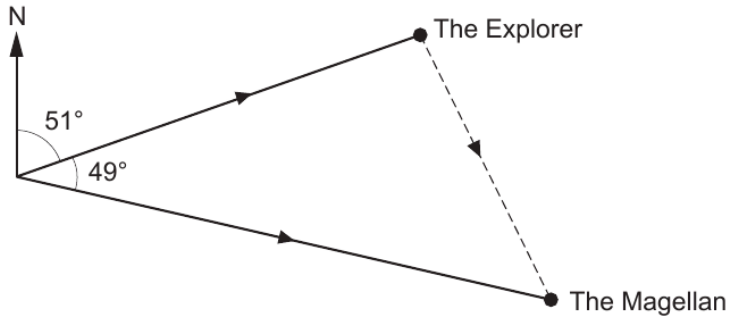


Diagram not drawn to scale

Immediately, The Explorer then heads directly towards The Magellan to pick up its passengers.
It travels at a speed of 30 km/h.
Calculate the time, to the nearest minute, when The Explorer will reach The Magellan.
[7]

Examiner only

Time when The Explorer will reach The Magellan is .....

(b) Calculate the bearing The Explorer has to sail on from 11:00 onwards to arrive at The Magellan. [5]

END OF PAPER

9. A helicopter flies from Swansea to Neath and on from Neath to Port Talbot.

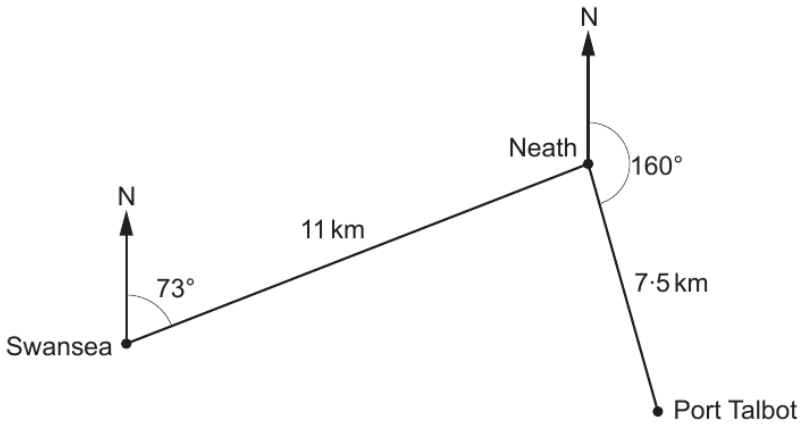


Diagram not drawn to scale

The bearing of Neath from Swansea is 073°.
The bearing of Port Talbot from Neath is 160°.

(a) By calculation, show that the bearing of Swansea from Neath is 253°. [1]

(b) From Port Talbot, the helicopter flies directly back to Swansea.
Calculate the bearing of this flight from Port Talbot to Swansea. [7]

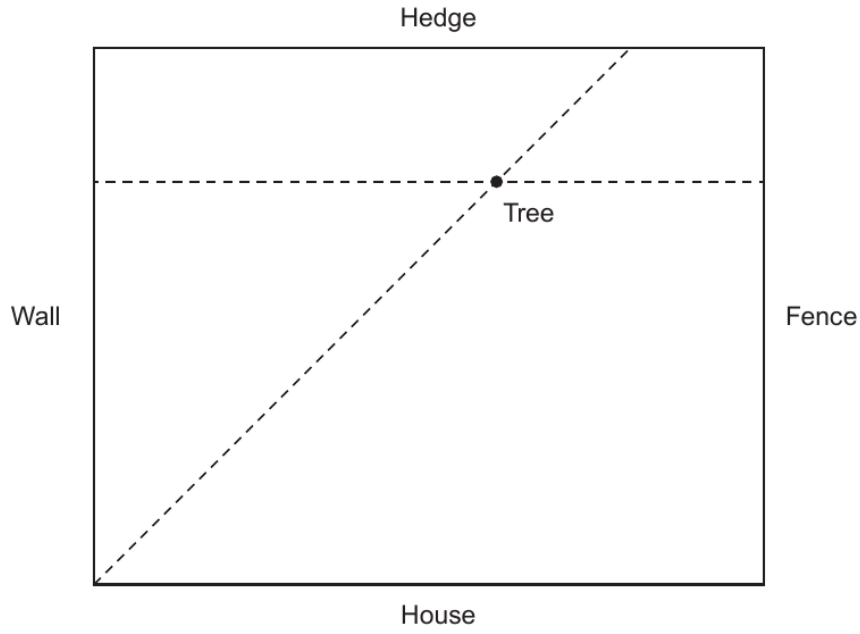
Examiner only

The bearing of the flight from Port Talbot to Swansea is ..... °

Examiner only

3. (a) Josif produces a scale drawing to show where he wants a tree planted in his garden.

Scale: 1 cm represents 0·5 m



He writes out instructions to show where the tree is to be planted.

Which **two** of the following instructions describe where the tree is to be planted?

A. The tree must be 2 m from the hedge.
B. The tree must be 1 m from the hedge.
C. The tree must be 6 m from the hedge.
D. The tree must be 3 m from the hedge.
E. The tree must be 1 m from the wall.

F. The tree must be equidistant from the hedge and the fence.
G. The tree must be equidistant from the hedge and the wall.
H. The tree must be equidistant from the wall and the house.
I. The tree must be equidistant from the hedge and the house.
J. The tree must be equidistant from the wall and the fence. [2]

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The two instructions are ..... and .....

Examiner only

(b) A garden centre buys trees from a grower for £30 each.
The garden centre sells the trees for £42 each.

(i) Calculate the percentage profit the garden centre makes from buying and selling one tree. [2]

(ii) The garden centre buys 10 of these trees to sell.
One of the trees gets damaged and cannot be sold.
The other 9 trees are sold.

Calculate the overall percentage profit or loss the garden centre makes from selling these trees.
You must state whether your answer is a profit or a loss.
You must show all your working. [4]

(iii) Of the 10 trees bought by the garden centre, what is the minimum number that need to be sold to ensure that the garden centre makes a profit?
Circle your answer. [1]

5 6 7 8 9