OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS A

A502/02

Unit B (Higher)

Candidates answer on the Question Paper

OCR Supplied Materials:
None

Other Materials Required:
- Geometrical instruments
- Tracing paper (optional)

SPECIMEN

Duration: 1 hour

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

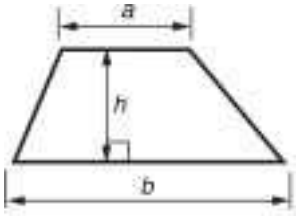
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

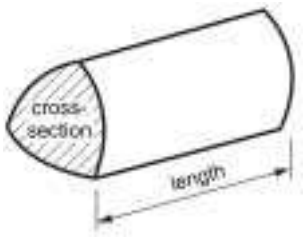
WARNING
You are NOT permitted to use a calculator for this paper.

Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a+b)\,h$



Volume of prism = (area of cross-section) $\times$ length

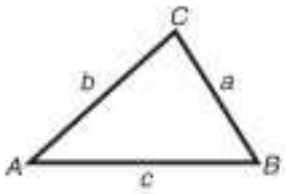


In any triangle *ABC*

Sine rule $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$

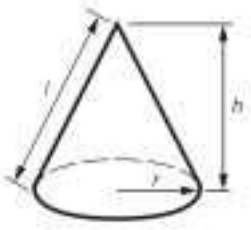


Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$

Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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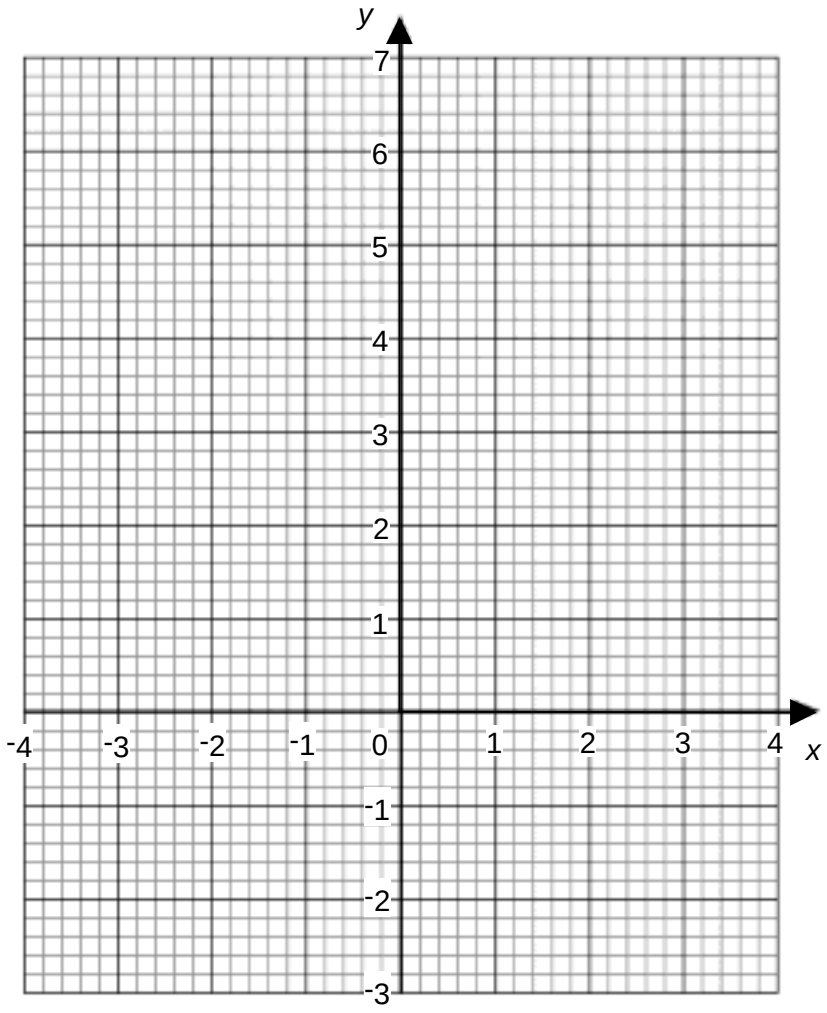
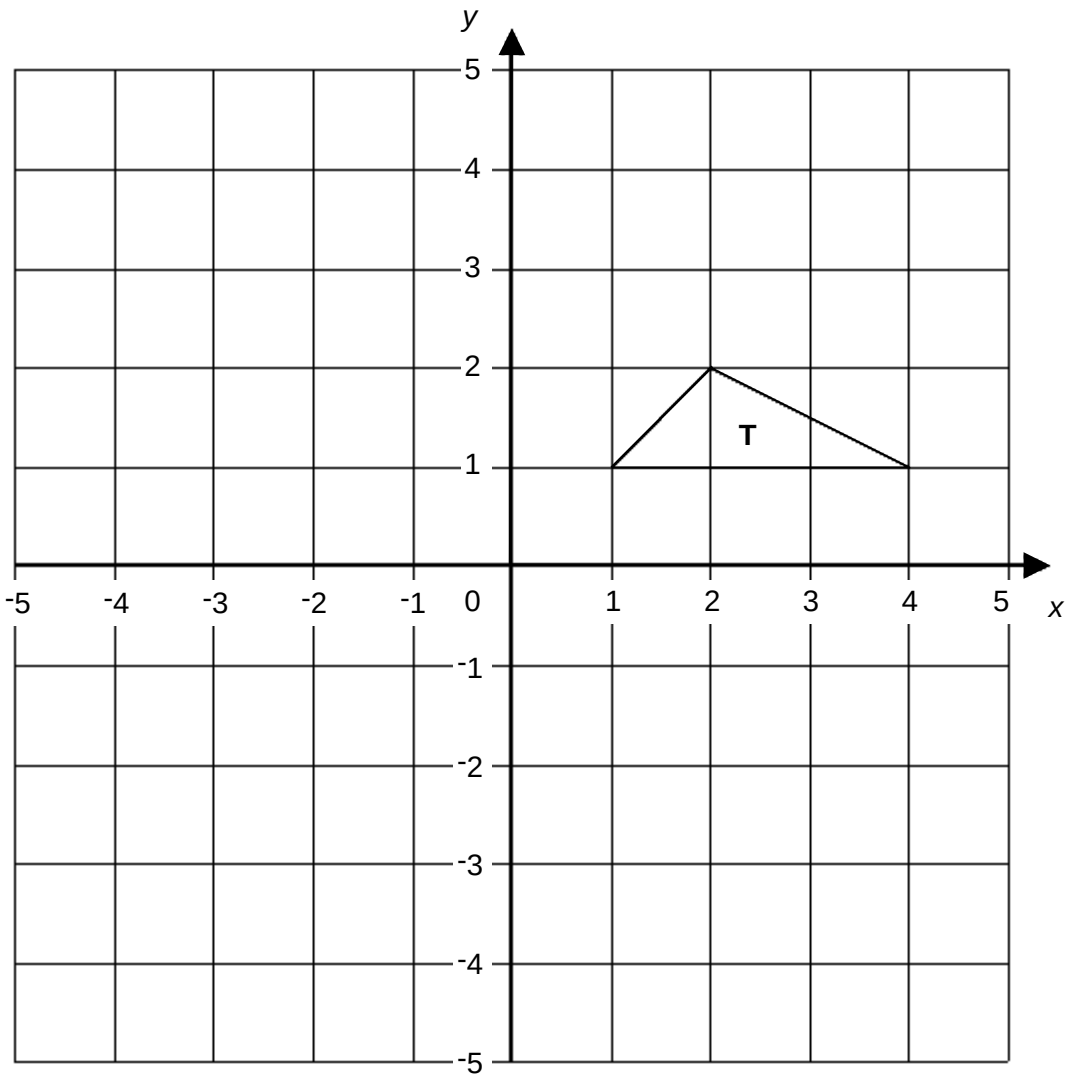
1 On the grid draw the line $y = 3x - 2$.



[3]

2 Reuben has carved a potato print in the shape of a triangle.

He prints the triangle on a grid as shown. He labels the triangle **T**.



(a) Reflect triangle **T** in the line $y = 2$. Label the image **A**. **[2]**

(b) Rotate triangle **T** 90° clockwise, centre (0, 0). Label the image **B**. **[2]**

(c) Translate triangle **T** using the vector $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$. Label the image **C**. **[2]**

(d) Enlarge triangle **T** with centre of enlargement (0, 0) and scale factor $^{-}1$. Label the image **D**. **[2]**

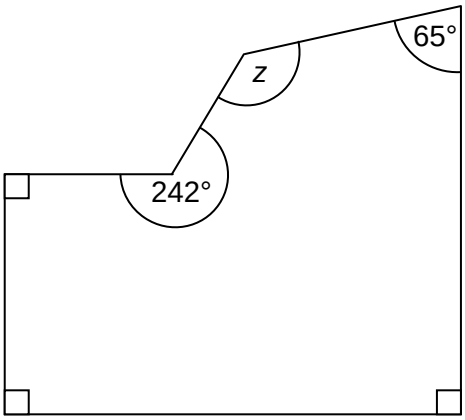
(e) Which, if any, of the triangles **A**, **B**, **C** and **D** can Reuben not draw with his potato print? Give a reason for your choice(s).

Triangle(s) _____ because _____

_____

_____ **[2]**

3 Josh is tiling a wall.
He needs to cut a tile to the shape shown in the diagram.



Not to scale

Work out angle *z*.

_____ **°[4]**

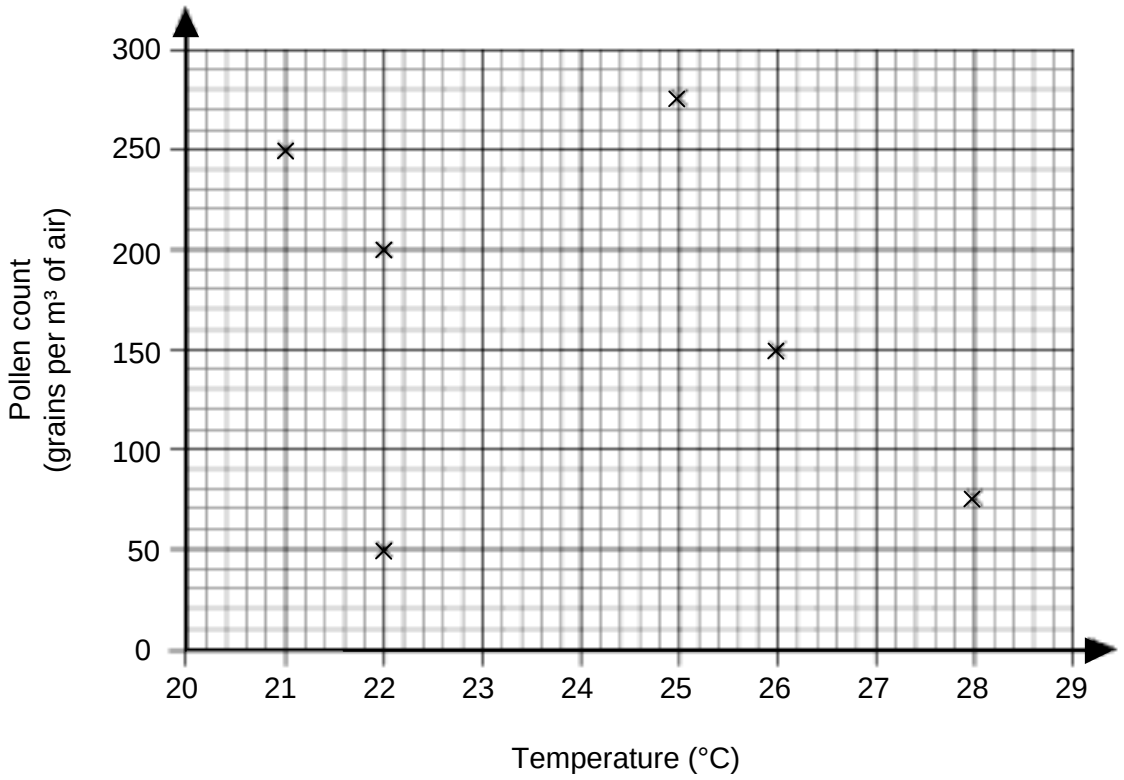
4* The higher the level of pollen in the air the more hay fever sufferers will be affected.

The table shows the temperature, humidity and pollen count in the air on six days in May.

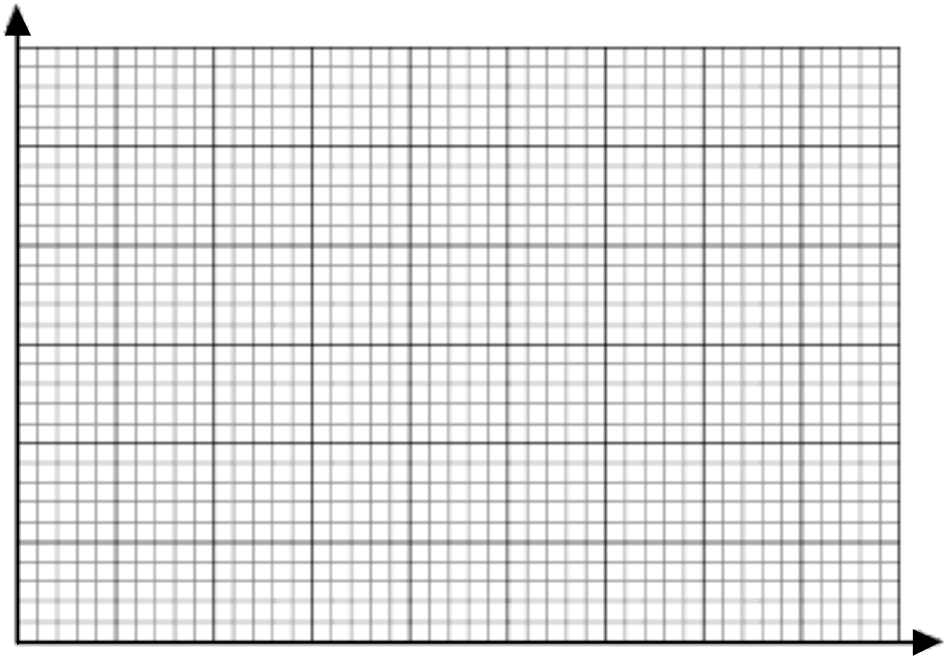
Temperature (°C)	Humidity (%)	Pollen count (grains per m^3 of air)
28	60	75
26	54	151
22	45	199
22	68	50
21	37	248
25	32	275

Carmela thinks that pollen count is affected by temperature and by humidity.

Carmela draws this scatter graph to show pollen count against temperature.



On the grid below, draw another scatter graph for Carmela.
Use the two graphs to decide if Carmela is right.



[6]

5 Four teams competed in a competition to design a strong bridge that was as light as possible. The efficiency of each bridge was worked out using this formula.

$$\text{Efficiency} = \text{maximum load the bridge could support} \div \text{weight of the bridge}$$

The table shows the results.

Team	Maximum load (kg)	Weight (kg)	Efficiency
1	14·5	0·70	
2	11·6	0·48	
3	16·4	1·12	
4	16·7	0·89	

Use estimation to identify the most efficient team and the least efficient team.

Most efficient _____

Least efficient _____ **[5]**

6 **(a)** Solve.

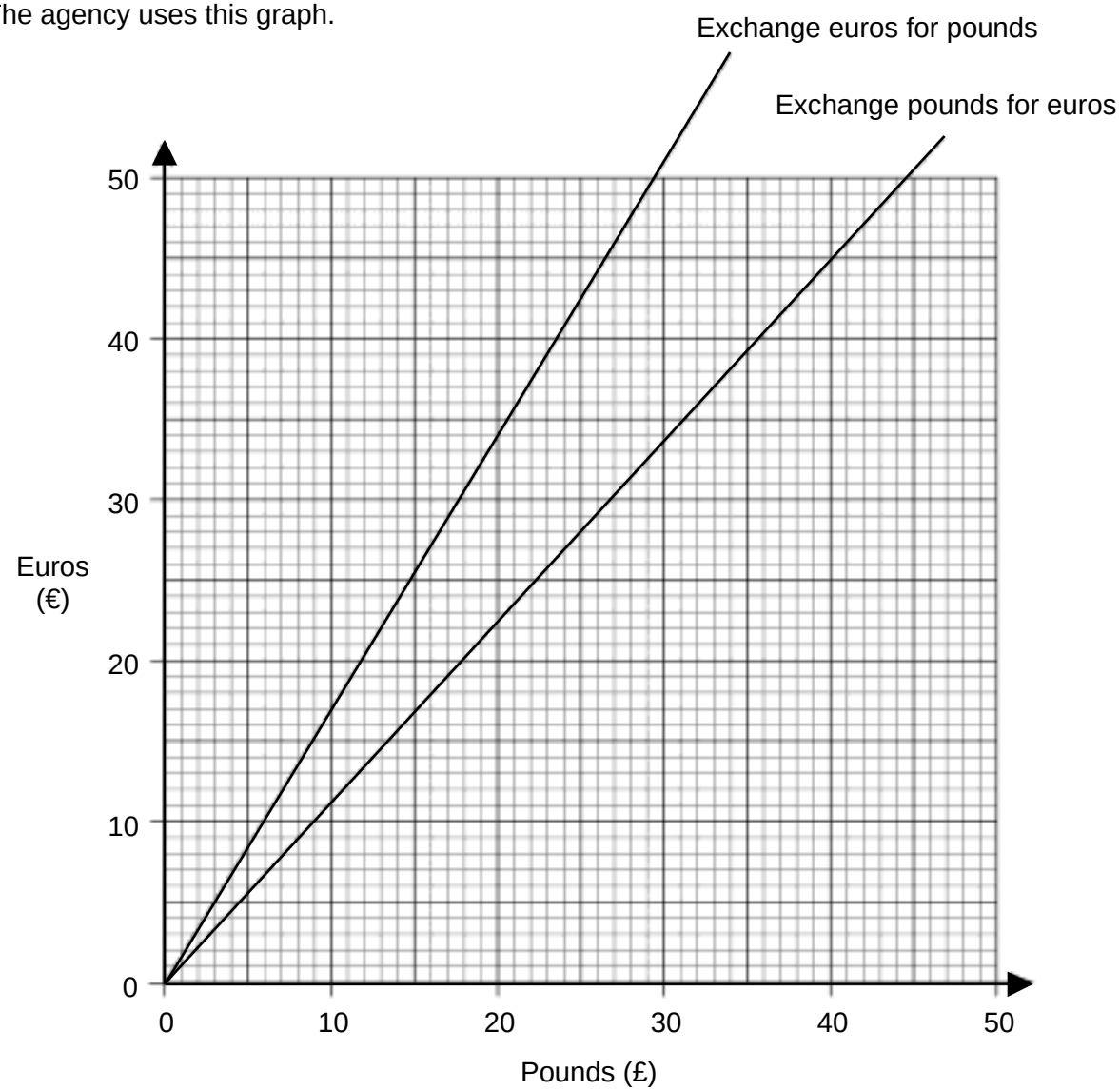
$4x - 7 < 15$

(a) _____ **[2]**

(b) Represent your solution on the number line.

[1]

7 A travel agency exchanges currency.
The agency uses this graph.



Georgia changes £25 into euros at the travel agency.
She then gets a text to say her trip has been cancelled.
She returns to the agency to change all these euros back into pounds.

How much has Georgia gained or lost by changing £25 into euros and back again?

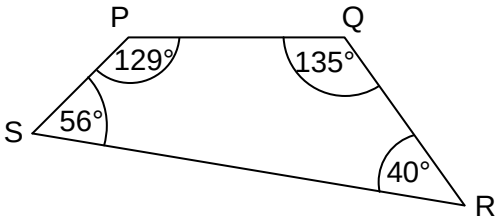
£ _____ **[4]**

8 Solve algebraically these simultaneous equations.

$$3x + 2y = 1$$
$$2x - 3y = 18$$

$x =$ _____, $y =$ _____ **[4]**

9 **(a)** The quadrilateral PQRS has angles as shown.

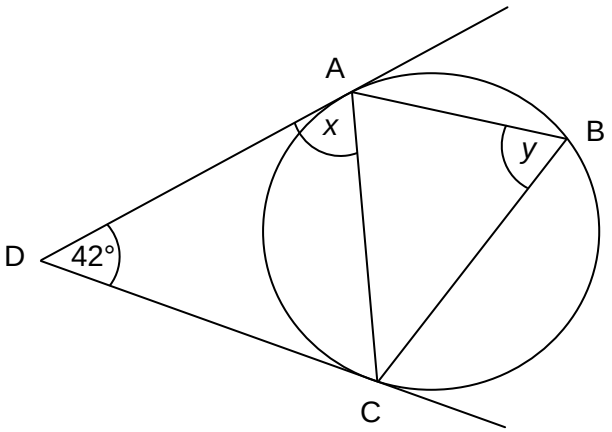


Not to scale

Give a reason why it is not possible to draw a circle so that all 4 corners P, Q, R and S lie on the circumference of the circle.

_____ **[1]**

(b) The vertices of the triangle ABC lie on the circumference of a circle.
DA and DC are tangents to the circle.



Not to scale

Work out angles *x* and *y*. Give reasons for your answers.

x = _____° because _____

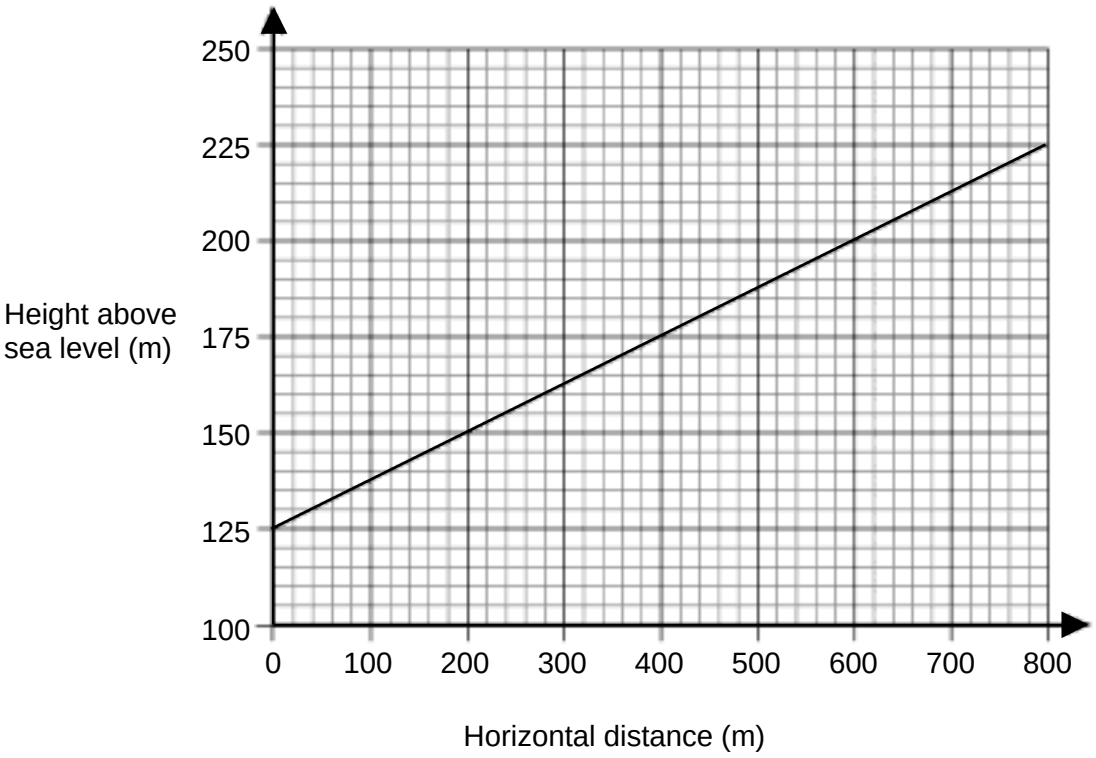
_____

y = _____° because _____

_____ **[4]**

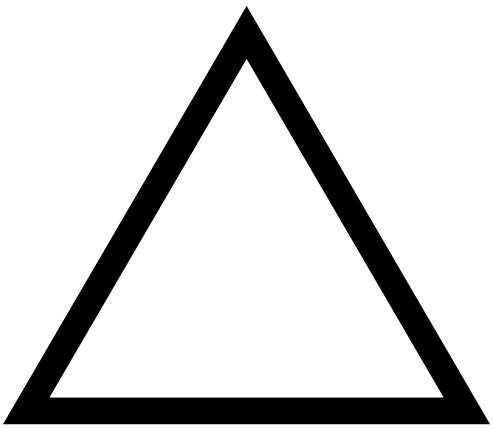
10 The gradient of roads is shown by signs like this.

The graph represents the height above sea level of a road.



A sign is going to be displayed to show how steep the road is.

Complete this road sign.



[3]

11 (a) Evaluate.

(i) $16^{-0.5} \times 27^{\frac{1}{3}}$

(a)(i) _____ **[3]**

(ii) $(\sqrt{5})^4$

(ii) _____ **[1]**

(iii) $\sqrt{7} \times \sqrt{28}$

(iii) _____ **[2]**

(b) Find one quarter of 4^{12}.
Give your answer as a power.

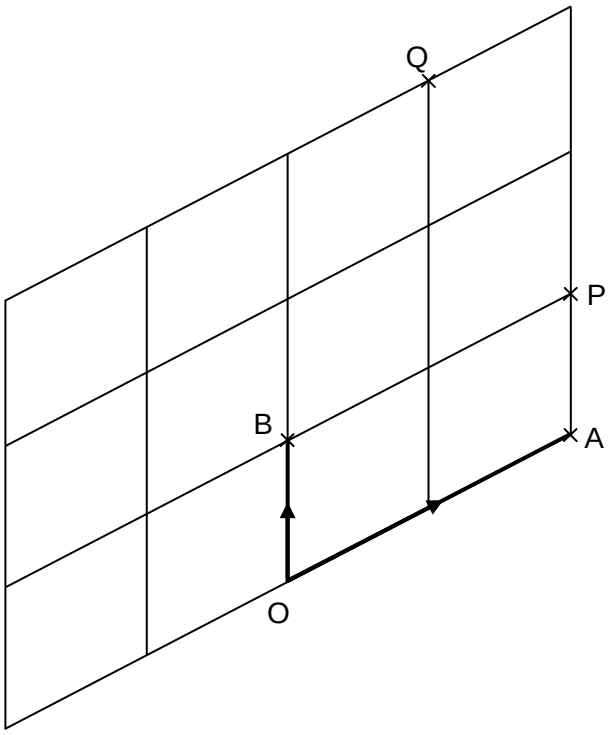
(b) _____ **[1]**

(c) Write $0.\dot{5}\dot{3}$ as a fraction.

(c) _____ **[2]**

12 A rat runs through a maze.
The maze consists of 12 congruent parallelograms.
In the diagram the lines show the paths in the maze that the rat can run along.

$\overrightarrow{OA} = \mathbf{a}$. $\overrightarrow{OB} = \mathbf{b}$.



The rat begins its run at the point O.

(a) Write down in terms of **a** and **b** a vector that represents the rat run from

(i) O to P,

(a)(i) _____ **[1]**

(ii) P to Q.

(ii) _____ **[2]**

(b) Another rat enters the maze at O and follows a path represented by the vector 2**b** – **a**.

Mark the end of this path on the diagram using the letter R. **[1]**

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