

Pre-Leaving Certificate Examination
Mathematics (Project Maths)

Paper 2

Ordinary Level

February 2010 2½ hours

300 marks

Examination number

Centre stamp

Running total	
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For examiner	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

Grade

Instructions

There are **three** sections in this examination paper:

Section 0	Area & Volume (old syllabus)	50 marks	1 question
Section A	Concepts and Skills	125 marks	5 questions
Section B	Contexts and Applications	125 marks	3 questions

Answer **all nine** questions, as follows:

In Section 0, answer question 1

In Section A, answer questions 2, 3, 4, 5 and 6

In Section B, answer:

question 7

question 8

either question 9A **or** question 9B.

Write your answers in the spaces provided in this booklet. There is space for extra work at the back of the booklet. Extra paper may be used if needed. Label any extra work clearly with the question number and part.

The booklet *Formulae and Tables* may be used.

Marks will be lost if all necessary work is not clearly shown.

Answers should include the appropriate units of measurement, where relevant.

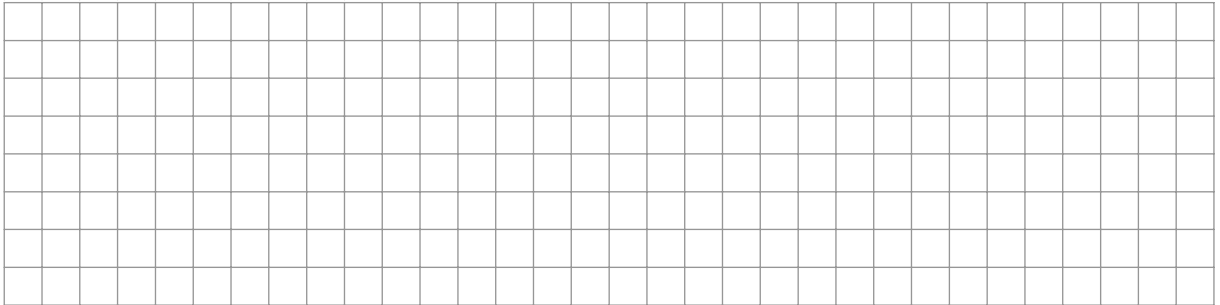
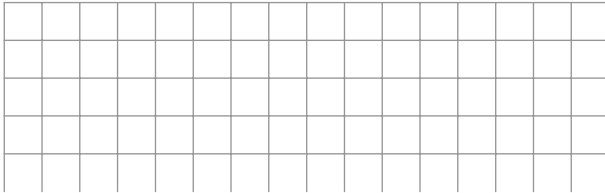
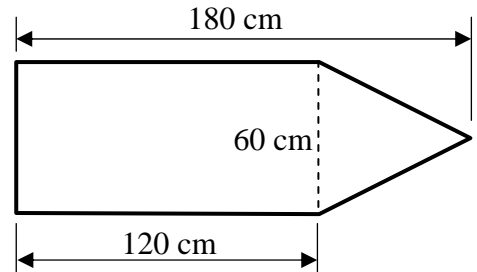
Answers should be given in simplest form, where relevant.

Answer **Question 1** from this section.

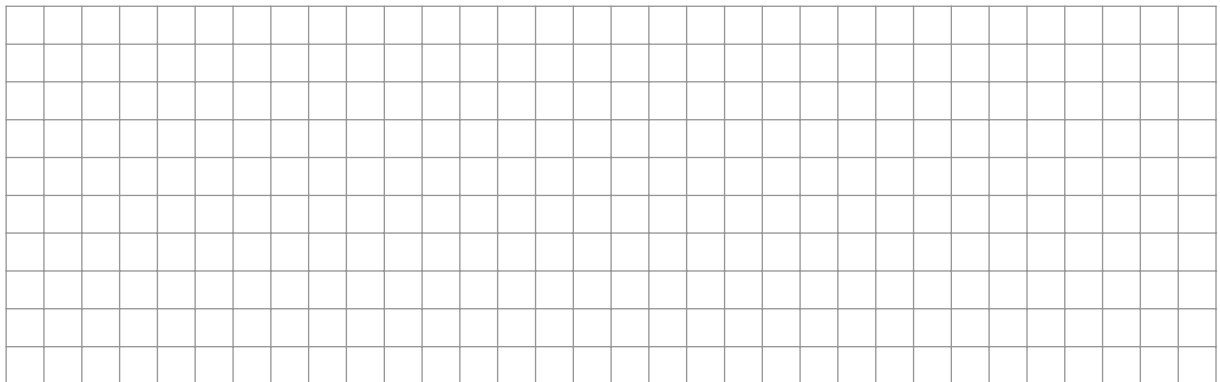
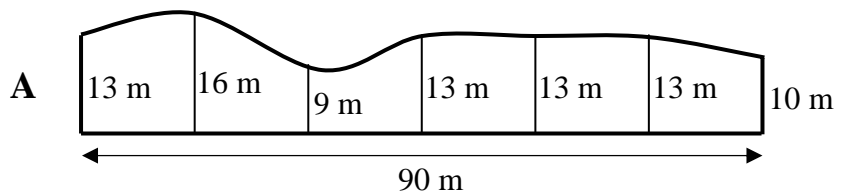
Question 1

(50 marks)

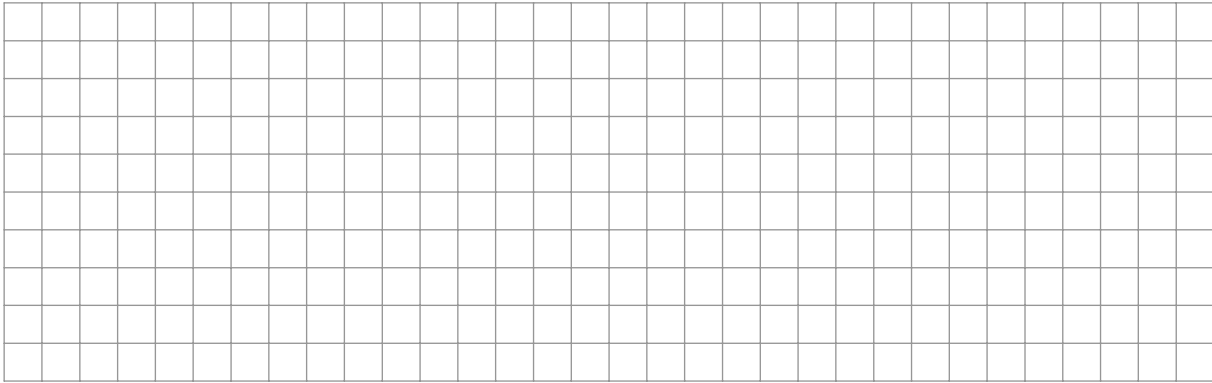
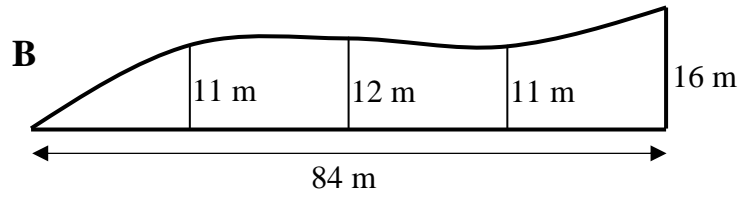
- (a) Find the area of the figure on the right.
Express your answer in m^2 .



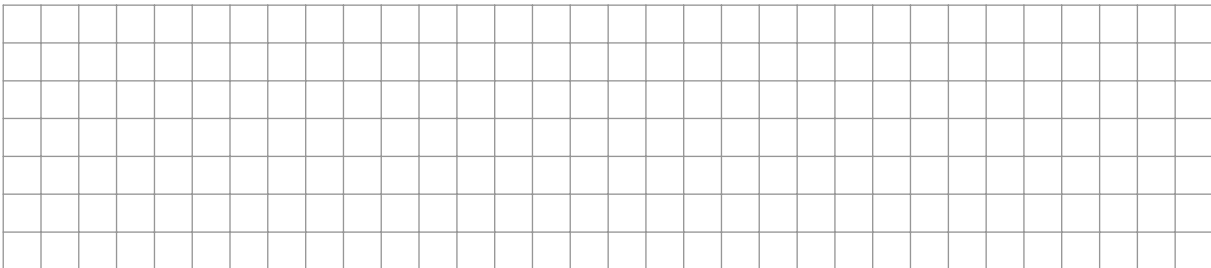
- (b) Use Simpson's rule to determine which of the shapes A or B below has the greater area, and by how much.



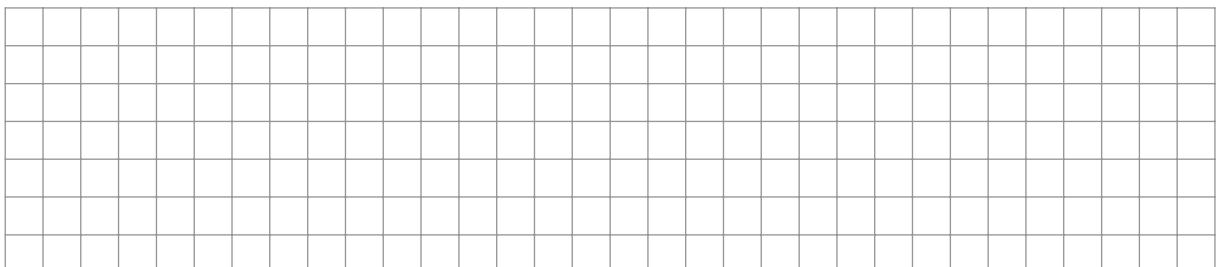
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- (c) (i) A cone has radius r cm and vertical height $\frac{K}{\pi}$ cm.
If the volume of this cone is $r^2 \text{ cm}^3$, find K .



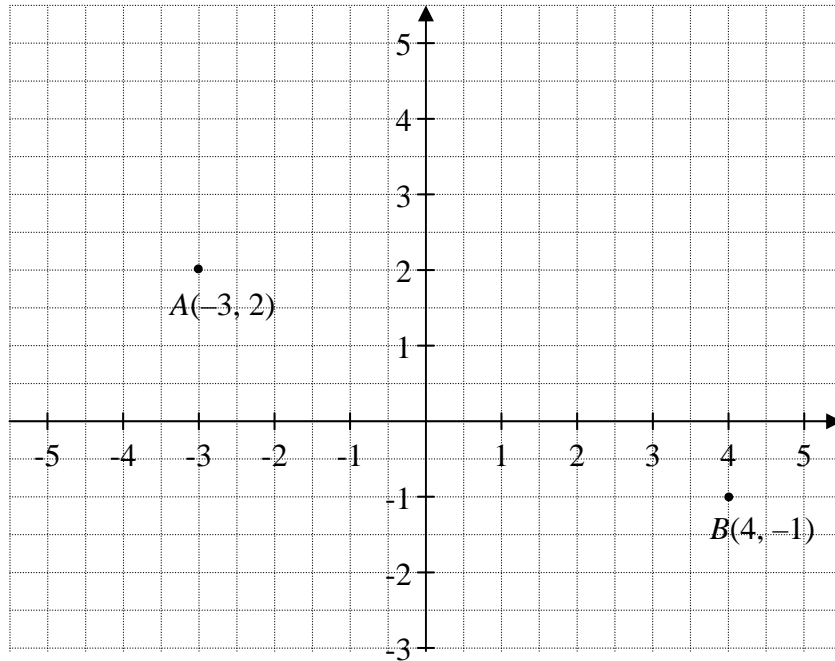
- (ii) The vertical height of a cylinder is h cm and the radius of its base is $h\sqrt{2}$ cm.
If the total volume of four such cylinders is 125π , find the value of h .



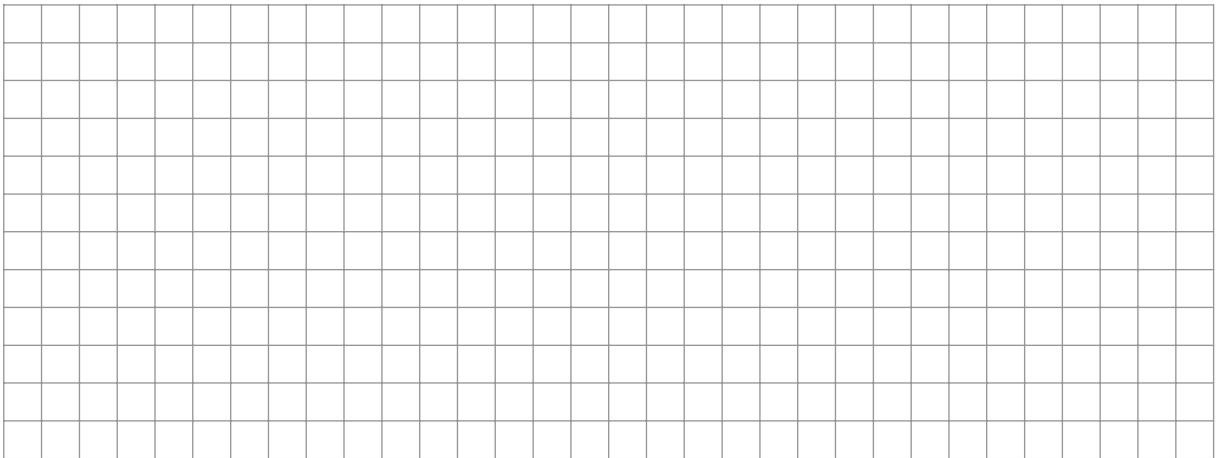
Question 5

(25 marks)

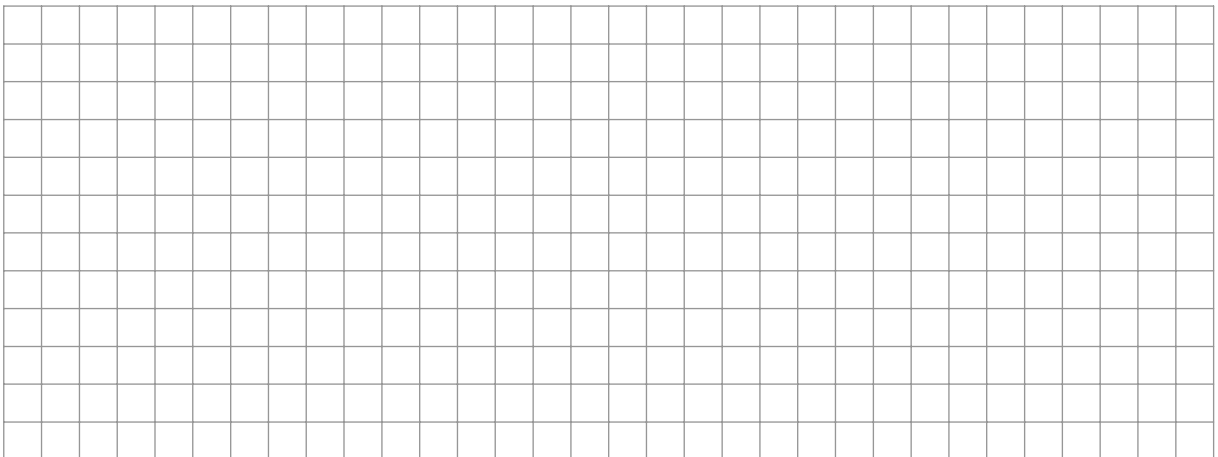
- (a) Two points $A(-3, 2)$ and $B(4, -1)$ are shown on the diagram below. Plot two suitable points C and D so that $ABCD$ is a parallelogram. Label the points and write down their co-ordinates.



- (b) By performing suitable calculations, show that the figure you have drawn is indeed a parallelogram.



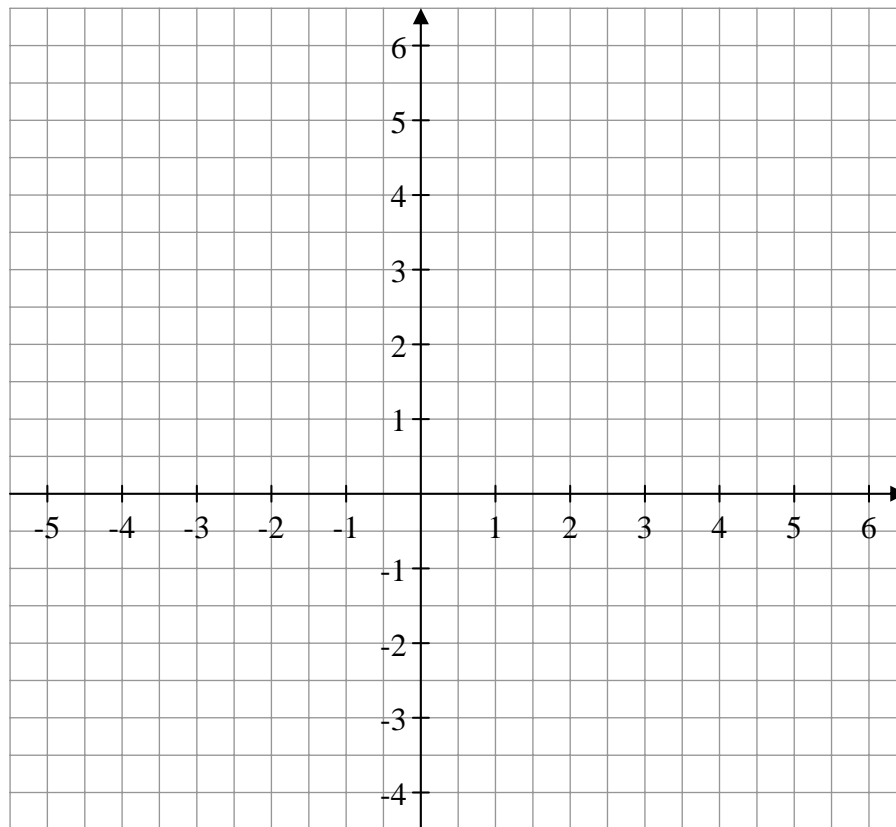
- (c) Verify that the diagonals of the parallelogram bisect each other.



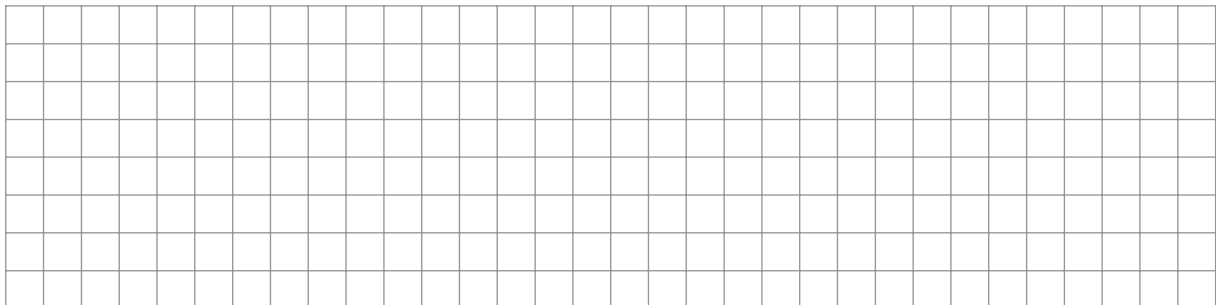
Question 6

(25 marks)

- (a) On the diagram below, show the triangle ABC , where A is $(-4, 1)$, B is $(-2, 5)$ and C is $(6, 1)$.

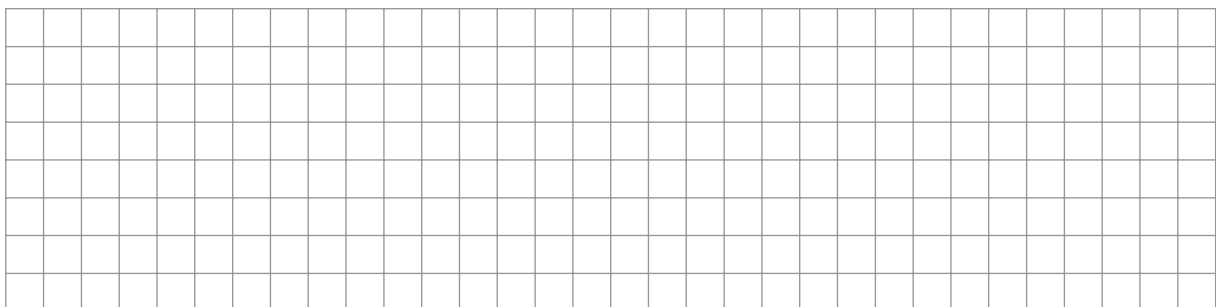


- (b) Find D , the midpoint of $[AC]$, and label this point on the diagram.



- (c) Hence, construct on the diagram the circle with diameter $[AC]$.

- (d) Show that angle $\angle ABC$ is a right angle.



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in this section, answer Question 7 and Question 8, and **either** Question 9A **or** Question 9B.

Question 7

Probability and Statistics

(40 marks)

- (a) A teacher asked the students in her class to estimate the height of the church opposite the school in metres.



The stem-and-leaf diagram shows all the results:

3	5	9			
4	0	2	6	8	8
5	3	3	5	7	7
6	0	5	5	5	
7	4	8			
8	2	7			

Key: 3 | 5 represents 35 m

- (i) How many students were in the class?

- (ii) Describe the **shape** of the distribution of the data.

- (iii) What was the median estimate?

- (iv) Explain the answer to part (iii) to someone who does not know what the word "median" means.

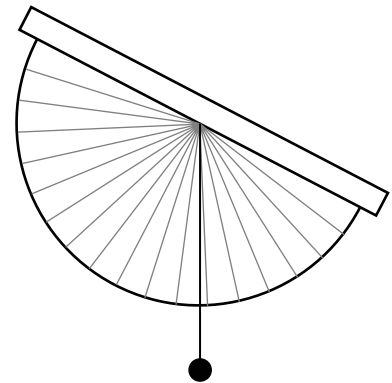
Question 8

Geometry and Trigonometry

(40 marks)

The students mentioned in Question 7(a) above went to measure the height of the church.

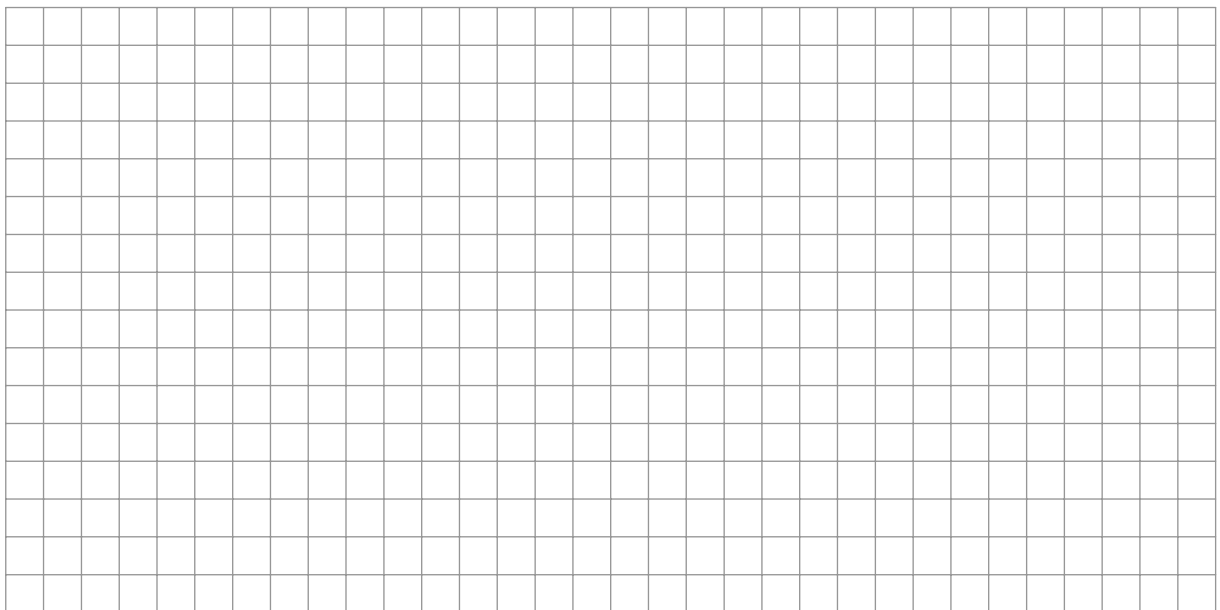
- (a) Peter explained his group’s method:
“We made a clinometer from a protractor, a pen tube, some thread and a weight.
We measured the distance from here to the church and it was 92 metres.
We made sure the ground was flat. Then we used the clinometer to look up at the top of the spire of the church. The weight had moved from 90° to 65° , so we knew the angle up was 25° . We worked out the height from that. But we had to remember to add on my height of 1.8 metres at the end.”



- (i) On the diagram below, show the measurements that Peter’s group made.



- (ii) Show how Peter’s group used these measurements to find the height of the church.



- (b) Hannah was in a different group from Peter. She explained her group’s method for finding the height of the church:

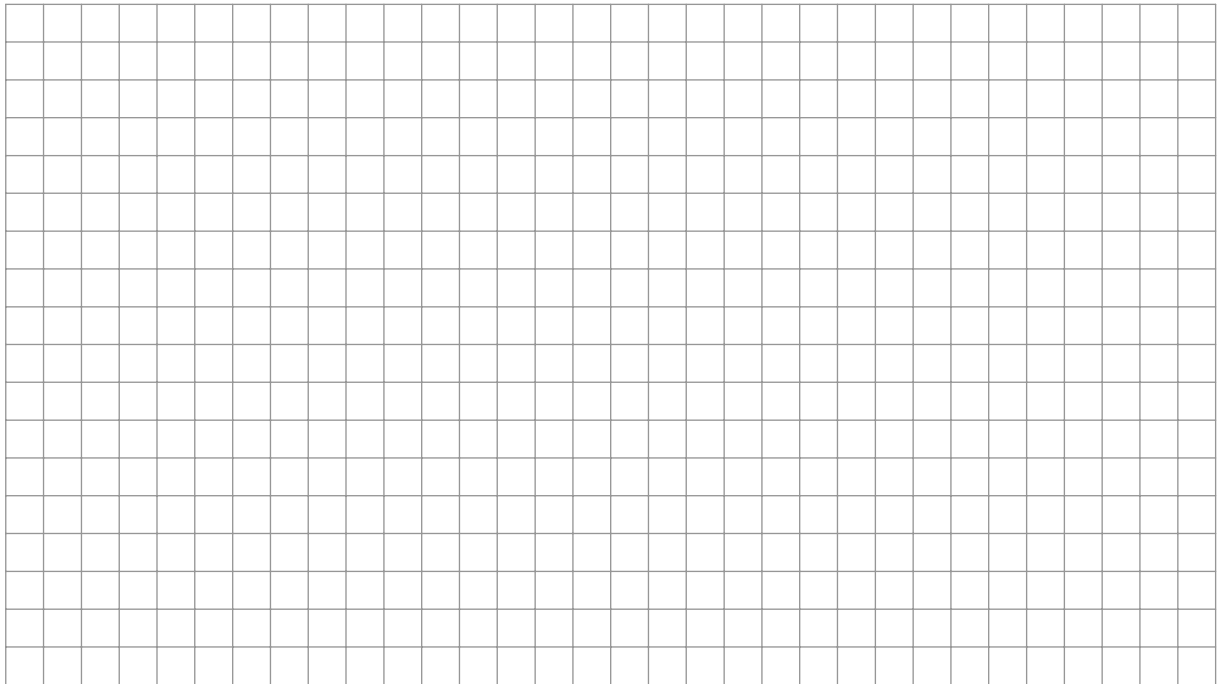
“It was really sunny and we used the shadows cast by the sun.

Amy stood with her back to the sun and we used a tape measure to measure Amy’s shadow along the ground from the tips of her toes to top of her shadow’s head. We also measured Amy’s height and recorded the results in the table.

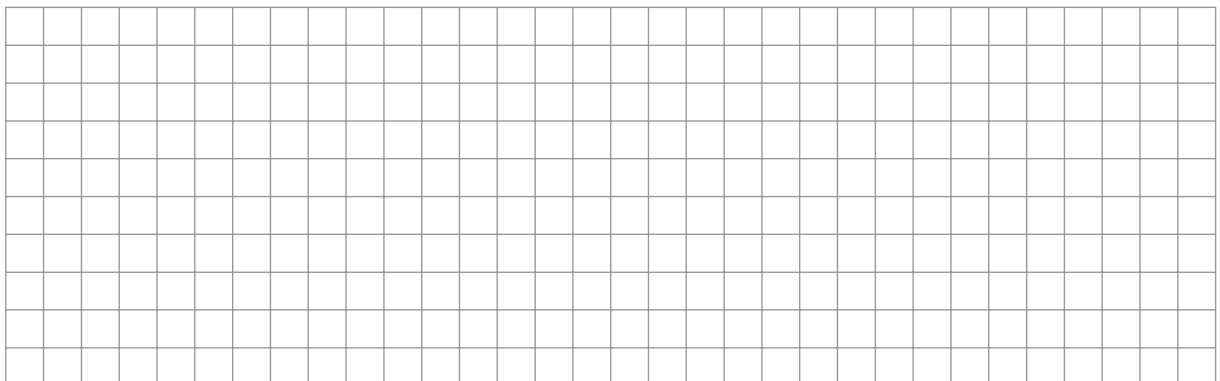
Then we recorded the length of the shadow cast by the church. We measured along the ground from the base of the church out to the end of its shadow and recorded this measurement.”

Amy’s shadow	2 m
Amy’s height	1.7 m
Church’s shadow	69.4 m

Show how Hannah’s group used their results to calculate the height of the church.



- (c) The church is actually 50 metres high. Calculate the percentage error in each group’s result.



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Question 9A

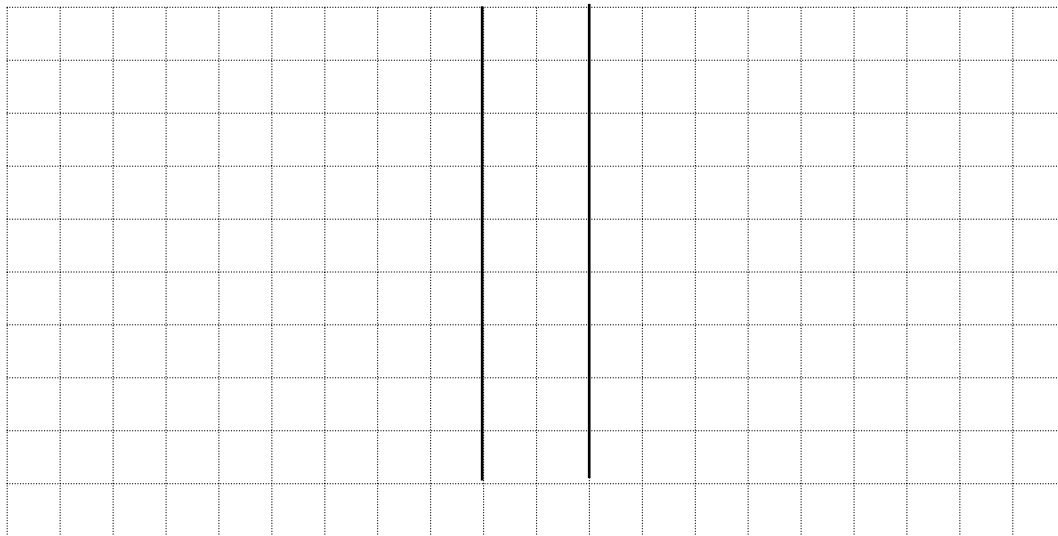
Probability and Statistics

(45 marks)

Oxygen levels in a polluted river were measured at randomly selected locations before and after a clean-up. These results are given in the table.

Before (mg/l)				After (mg/l)			
20	25	20	9	26	10	10	9
23	23	10	11	11	15	11	11
2	10	11	5	3	8	11	4
11				13			

(a) Construct a back-to-back stem-and-leaf plot of the above data.



(b) State **one difference** and **one similarity** between the distributions of the measurements before and after cleanup.

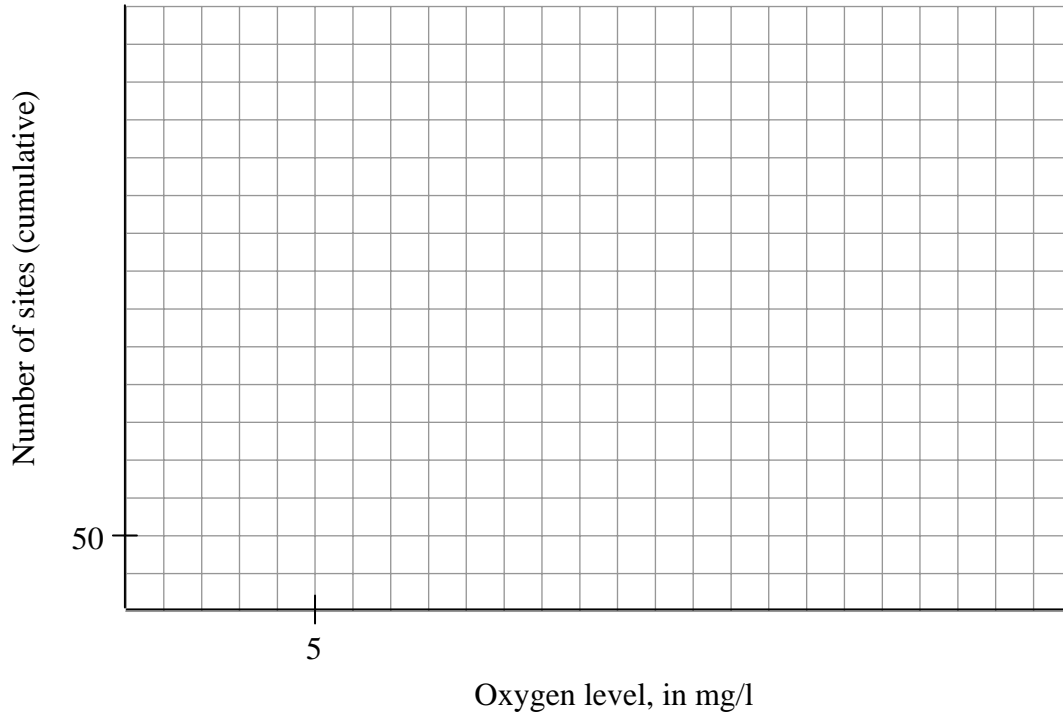
<i>Difference:</i>	
<i>Similarity:</i>	

(c) Perform a *Tukey Quick Test* on the data to see if there is evidence that the clean-up worked.

- (d) Oxygen levels were measured at 400 different sites on different rivers. The measurements are summarised in the table below.

Oxygen level (mg/l)	<5	<10	<15	<20	<25
Number of sites	200	285	365	385	400

Draw a cumulative frequency diagram to represent this data, using the scale indicated.



- (e) Use your cumulative frequency curve to estimate:

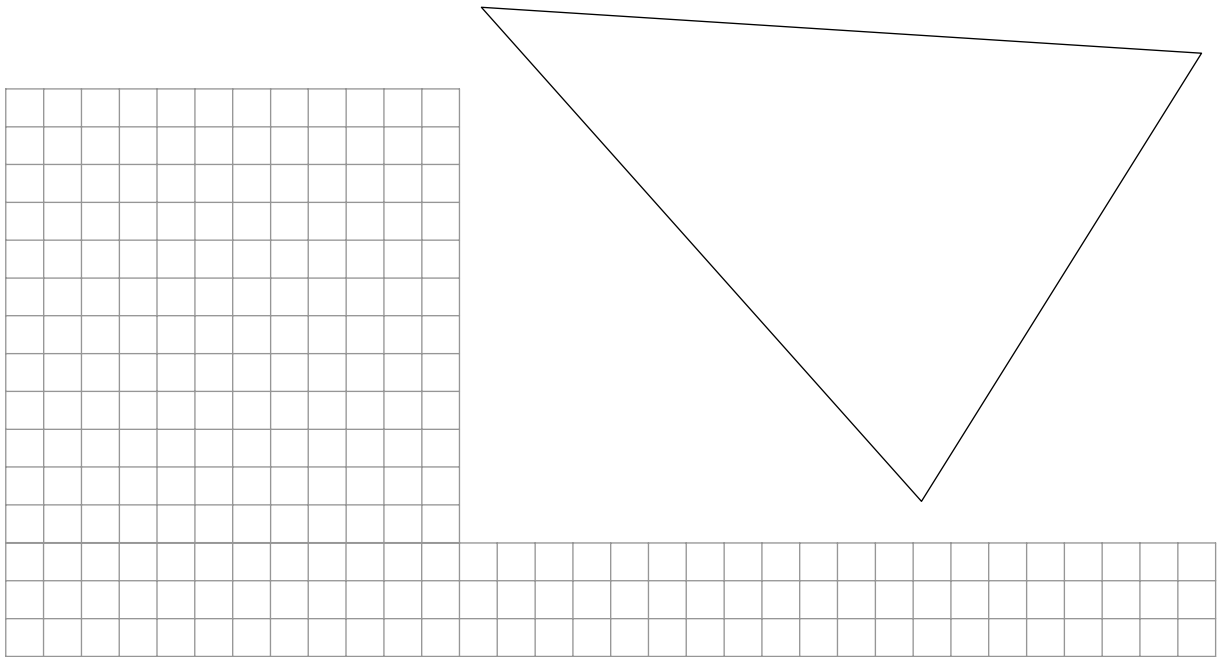
(i) the number of sites with oxygen levels below 23 mg/l

(iii) the interquartile range.

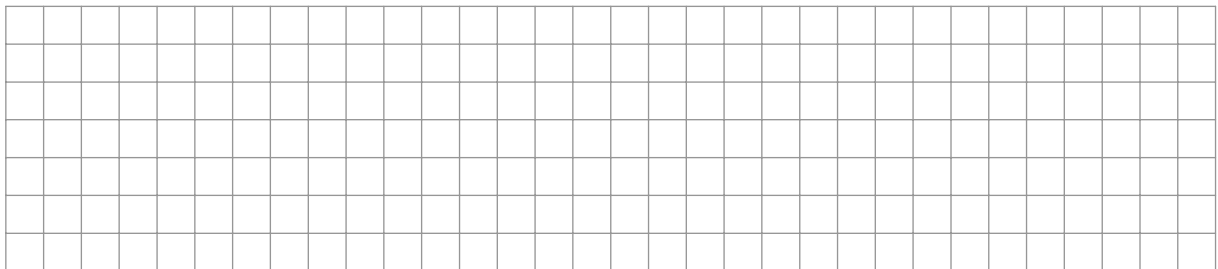
- (f) An oxygen level of between 2 and 8 mg/l indicates that the site is *moderately polluted*. If a site is chosen at random from the 400 sites in part (d), what is the probability that it is moderately polluted?

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- (b) Noel and Sarah trace the triangle from the photograph onto a page to find its area. Their drawing is shown here. By making suitable measurements on the drawing, verify the theorem you stated in part (a).

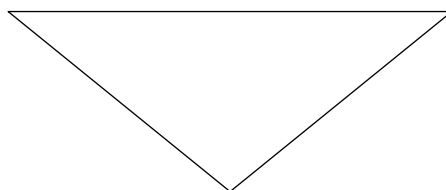


- (c) Suppose that the drawing were a true representation of the face of the sculpture. If each centimetre in the drawing represents 70 centimetres in reality, find the area of the face of the sculpture.



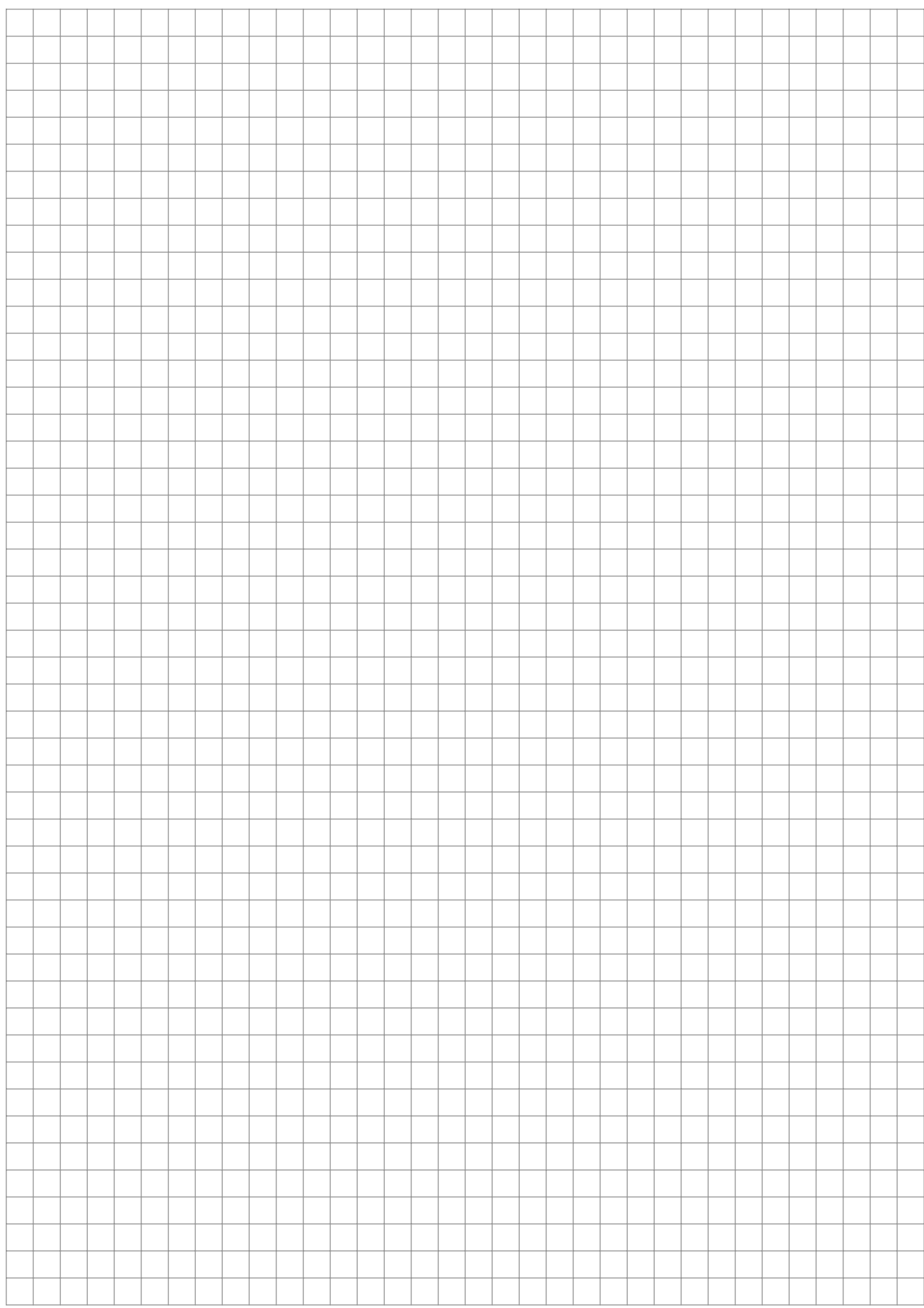
- (d) The true shape of the face of the sculpture is shown below. The people who made it have changed their minds and now want a parallelogram instead!

Show how the triangle could be turned into a parallelogram by making **one cut** and moving one of the two pieces. You should make it clear exactly where the cut is to be made, and show the new position of the piece moved.

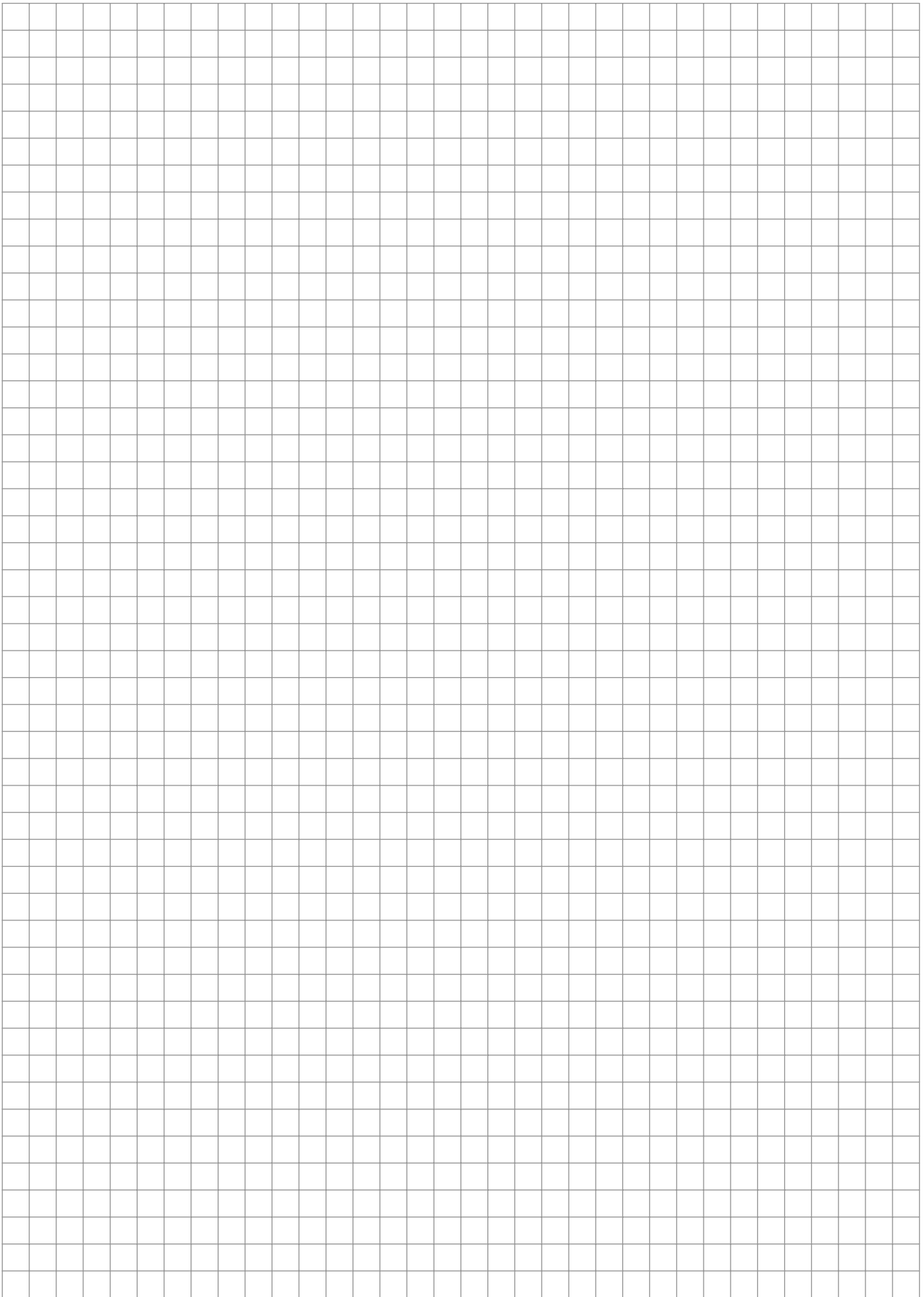


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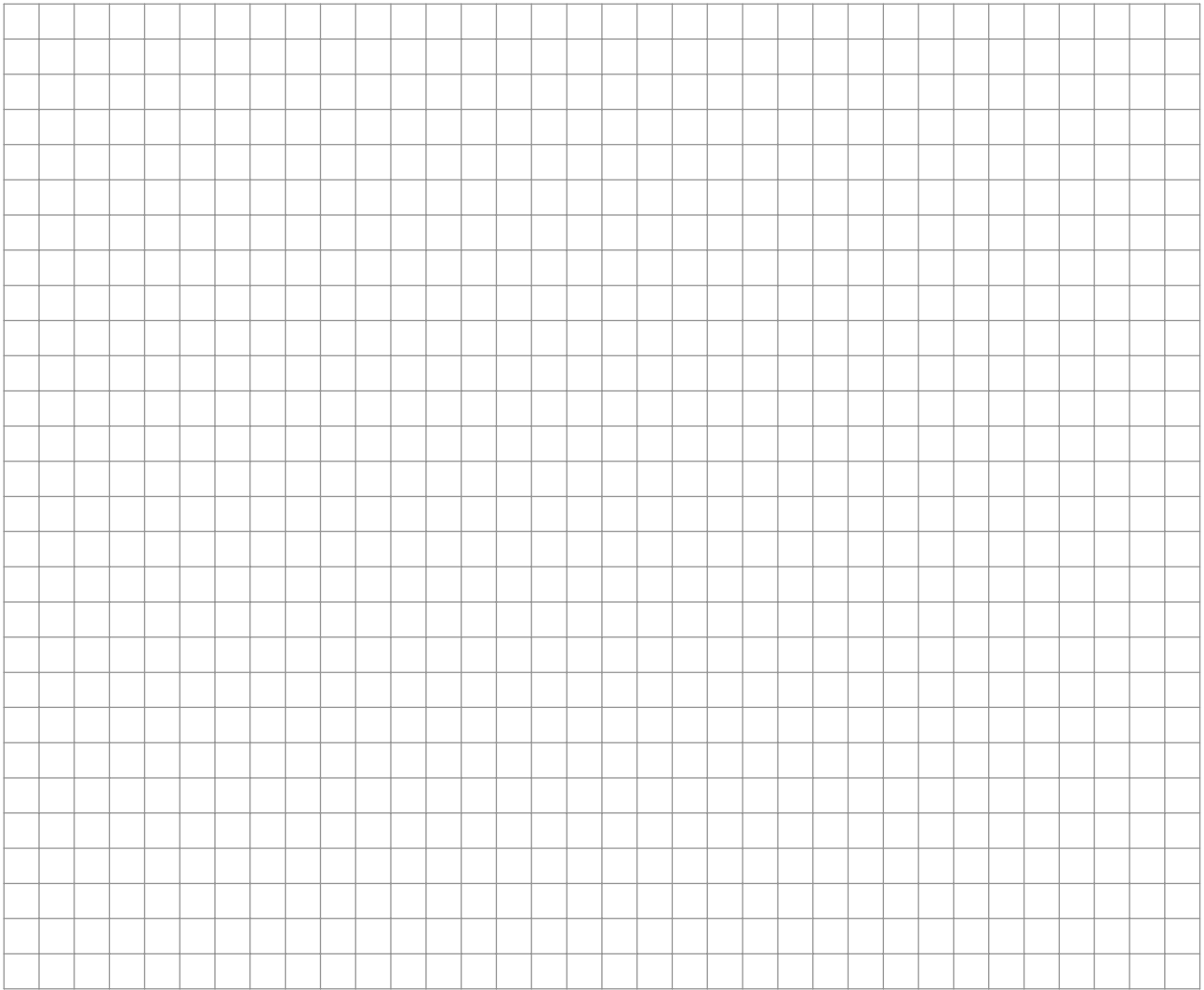
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Note to readers of this document:

This pre-Leaving Certificate paper is intended to help teachers and candidates in the 24 *Project Maths* initial schools prepare for the June 2010 examination. The content and structure of the paper do not necessarily reflect the 2011 or subsequent examinations in the initial schools or in all other schools.

Mathematics (Project Maths) – Paper 2

Pre-Leaving Certificate Paper – Ordinary Level
February 2010