



Coimisiún na Scrúduithe Stáit  
State Examinations Commission

Leaving Certificate Examination 2013  
Sample Paper

Mathematics  
(Project Maths – Phase 2)

Paper 2

Ordinary Level

Time: 2 hours, 30 minutes

300 marks

Examination number
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Centre stamp
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Running total	
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For examiner	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Grade
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## Instructions

There are **two** sections in this examination paper.

Section A	Concepts and Skills	150 marks	6 questions
Section B	Contexts and Applications	150 marks	3 questions

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

In Section A, answer:

Questions 1 to 5 and  
**either** Question 6A **or** Question 6B.

In Section B, answer Questions 7, 8, and 9.

Write your answers in the spaces provided in this booklet. You may lose marks if you do not do so. There is space for extra work at the back of the booklet. You may also ask the superintendent for more paper. Label any extra work clearly with the question number and part.

The superintendent will give you a copy of the booklet of *Formulae and Tables*. You must return it at the end of the examination. You are not allowed to bring your own copy into the examination.

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.

Write the make and model of your calculator(s) here:







**Question 4**

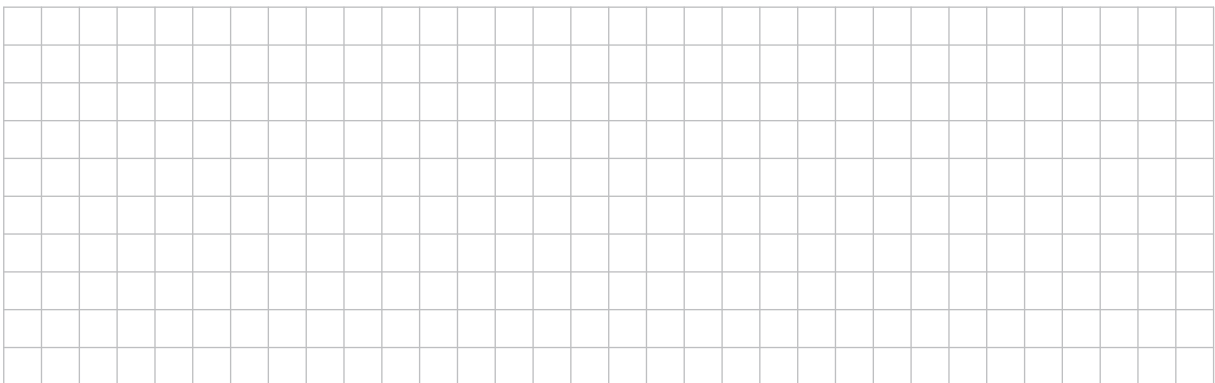
**(25 marks)**

The circle  $c$  has centre  $P(-2, -1)$  and passes through the point  $Q(3, 1)$ .

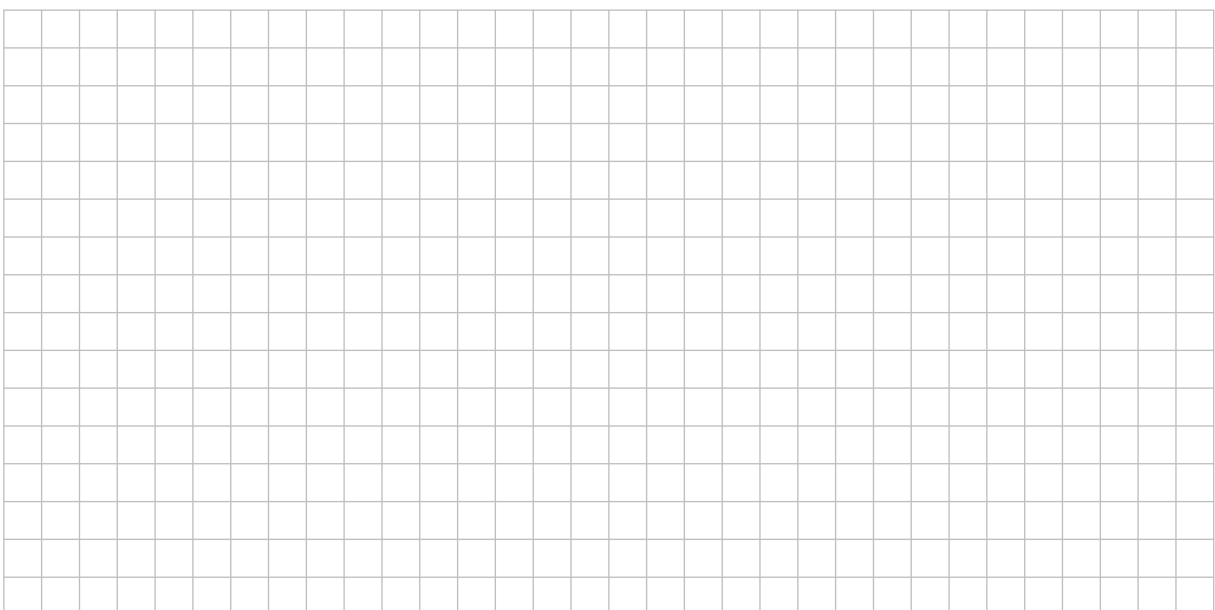
- (a) Show  $c$ ,  $P$ , and  $Q$  on a co-ordinate diagram.



- (b) Find the radius of  $c$  and hence write down its equation.



- (c)  $R$  is the point  $(1, 6)$ . By finding the slopes of  $PQ$  and  $QR$ , show that  $QR$  is a tangent to  $c$ .

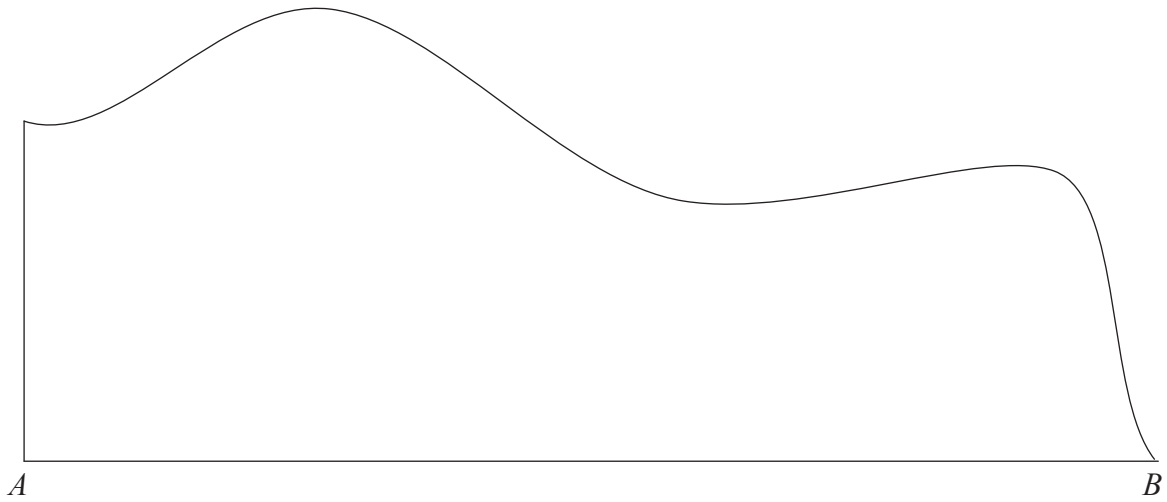


**Question 5**

**(25 marks)**

The diagram below shows a shape with two straight edges and one irregular edge. By dividing the edge  $[AB]$  into five equal intervals, use the trapezoidal rule to estimate the area of the shape.

Record your constructions and measurements on the diagram. Give your answer correct to the nearest  $\text{cm}^2$ .



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OR

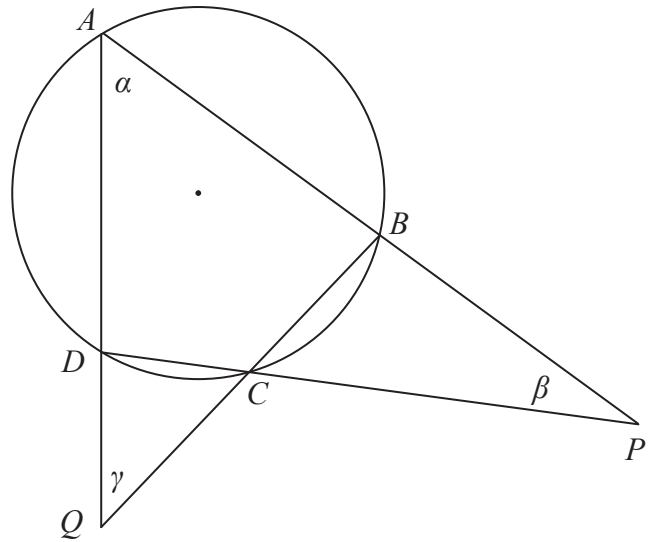
**Question 6B**

$ABCD$  is a cyclic quadrilateral.

The opposite sides, when extended, meet at  $P$  and  $Q$ , as shown.

The angles  $\alpha$ ,  $\beta$ , and  $\gamma$  are as shown.

Prove that  $\beta + \gamma = 180^\circ - 2\alpha$ .



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Answer Question 7, Question 8, and Question 9.

### Question 7

(75 marks)

The *King of the Hill* triathlon race in Kinsale consists of a 750 metre swim, followed by a 20 kilometre cycle, followed by a 5 kilometre run.

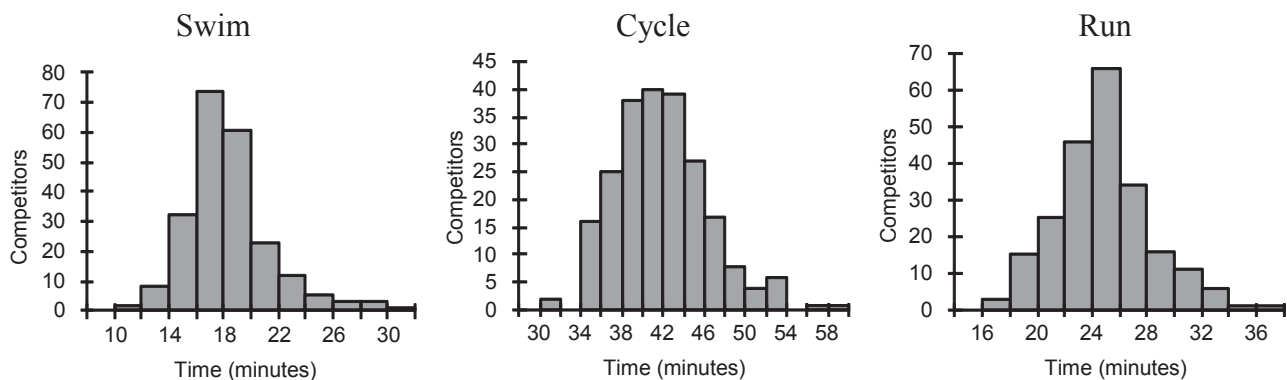
The questions below are based on data from 224 athletes who completed this triathlon in 2010.

Máire is analysing data from the race, using statistical software. She has a data file with each competitor's time for each part of the race, along with various other details of the competitors.



Lizzie Lee, winner of the women's event

Máire produces histograms of the times for the three events. Here are the three histograms.



- (a) Use the histograms to complete the following sentences:
- The event that, on average, takes longest to complete is the \_\_\_\_\_.
  - In all three histograms, the times are grouped into intervals of \_\_\_\_\_ minutes.
  - The time of the fastest person in the swim was between \_\_\_\_\_ and \_\_\_\_\_ minutes.
  - The median time for the run is approximately \_\_\_\_\_ minutes.
  - The event in which the times are most spread out is the \_\_\_\_\_.

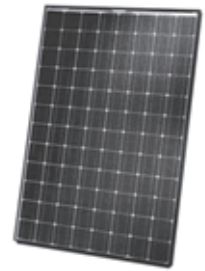




**Question 8**

**(45 marks)**

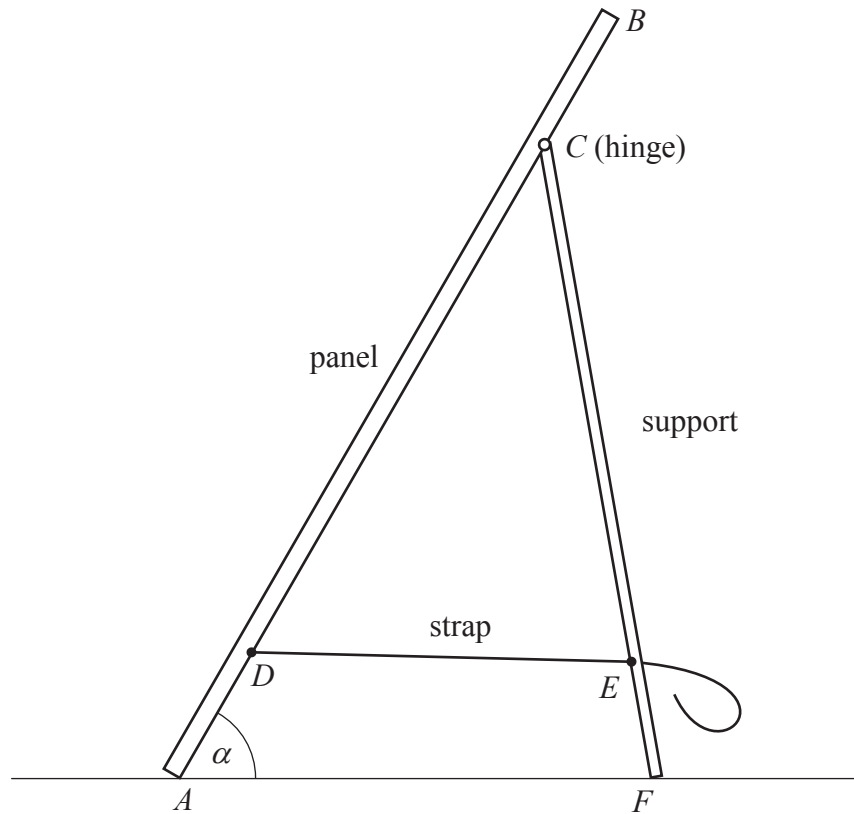
A stand is being used to prop up a portable solar panel. It consists of a support that is hinged to the panel near the top, and an adjustable strap joining the panel to the support near the bottom.



By adjusting the length of the strap, the angle between the panel and the ground can be changed.

The dimensions are as follows:

- $|AB| = 30$  cm
- $|AD| = |CB| = 5$  cm
- $|CF| = 22$  cm
- $|EF| = 4$  cm.



We want to find out how long the strap has to be in order to make the angle  $\alpha$  between the panel and the ground equal to  $60^\circ$

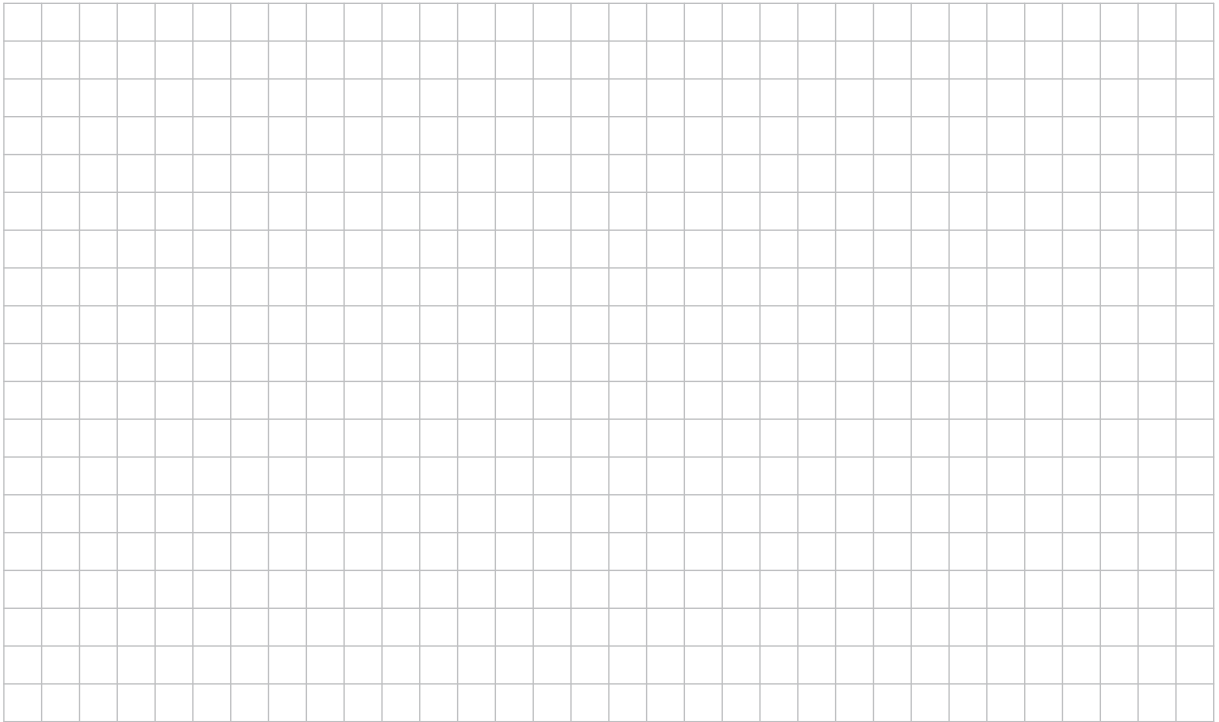
- (a) Two diagrams are given below – one showing triangle  $CAF$  and the other showing triangle  $CDE$ . Use the measurements given above to record on the two diagrams below the lengths of **two** of the sides in **each** triangle.

Triangle  $CAF$  with  $\angle A = 60^\circ$ .

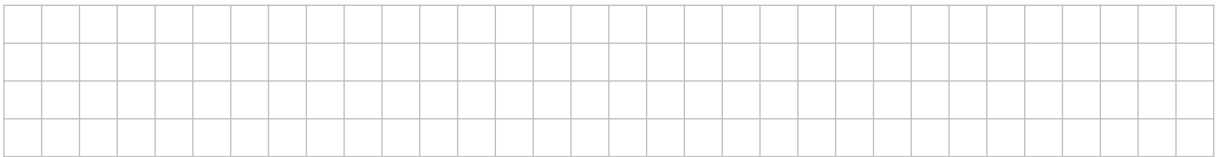
Triangle  $CDE$ .

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- (b) Taking  $\alpha = 60^\circ$ , as shown, use the triangle  $CAF$  to find  $|\angle CFA|$ , correct to one decimal place.



- (c) Hence find  $|\angle ACF|$ , correct to one decimal place.



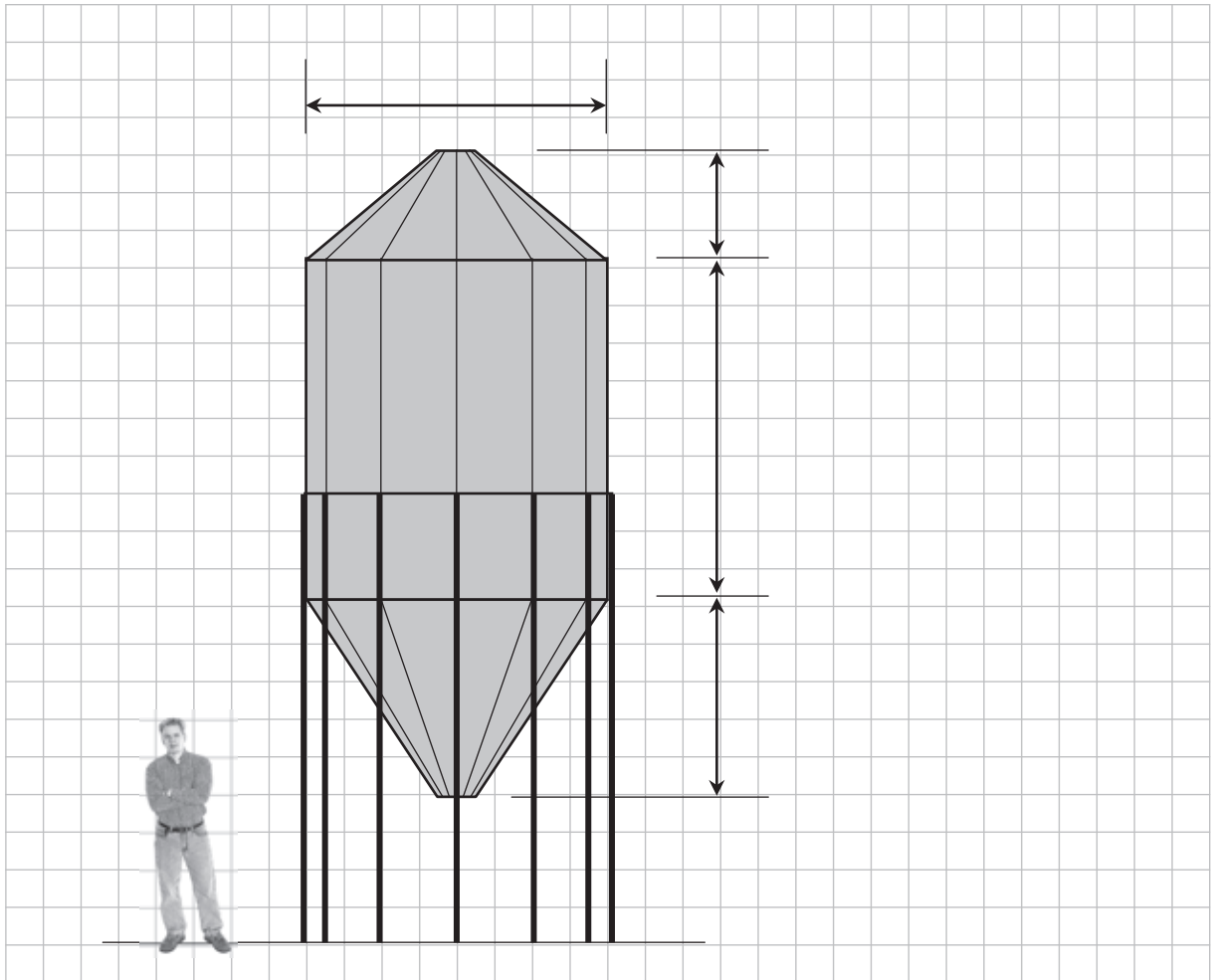
- (d) Use triangle  $CDE$  to find  $|DE|$ , the length of the strap, correct to one decimal place.



**Question 9**

**(30 marks)**

The diagram below is a scale drawing of a hopper tank used to store grain. An estimate is needed of the capacity (volume) of the tank. The figure of the man standing beside the tank allows the scale of the drawing to be estimated.



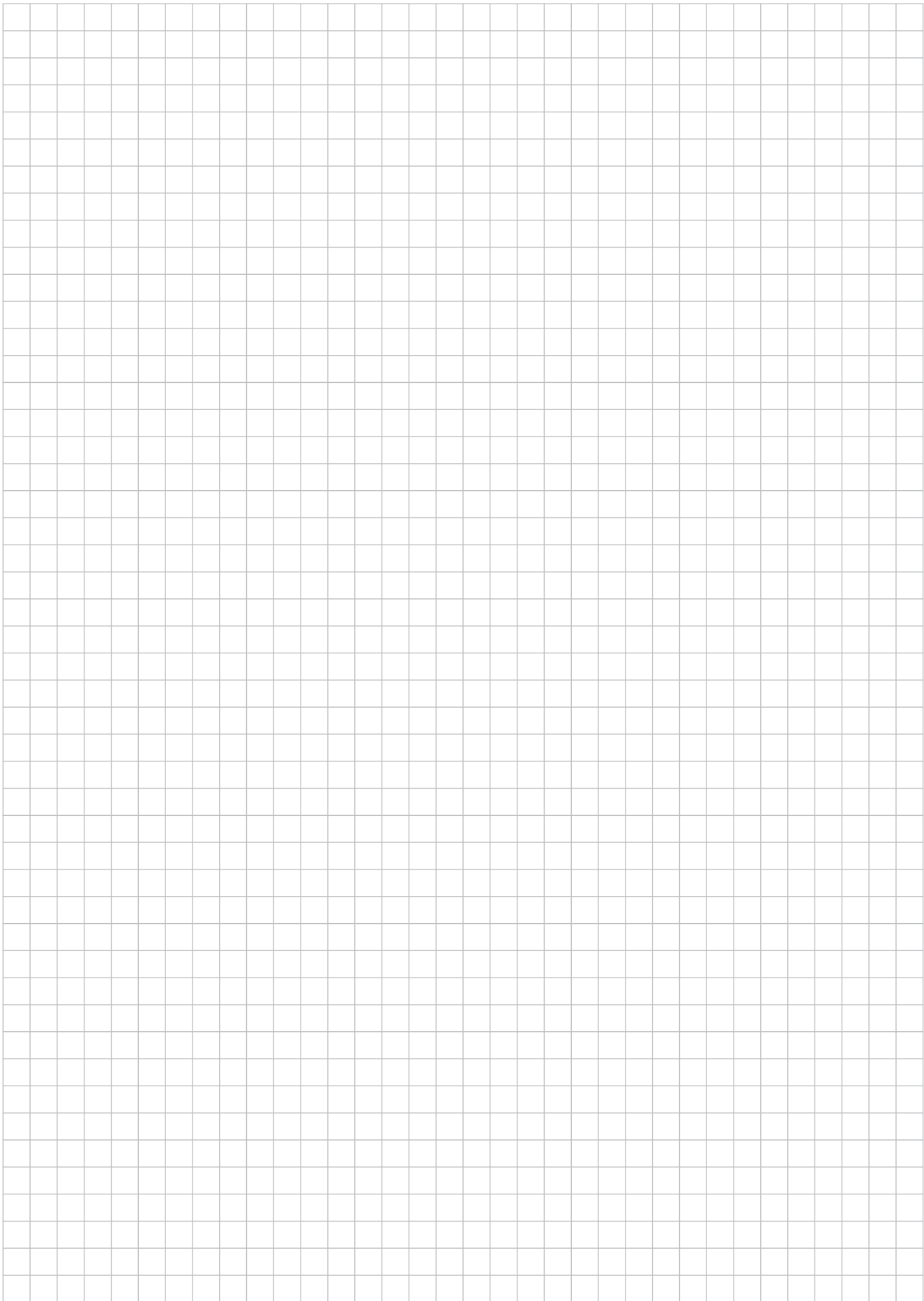
- (a) Give an estimate, in metres, of the height of an average adult man.

Answer: \_\_\_\_\_

- (b) Using your answer to part (a), estimate the dimensions of the hopper tank. Write your answers in the spaces provided on the diagram.
- (c) Taking the tank to be a cylinder with a cone above and below, find an estimate for the capacity of the tank, in cubic metres.

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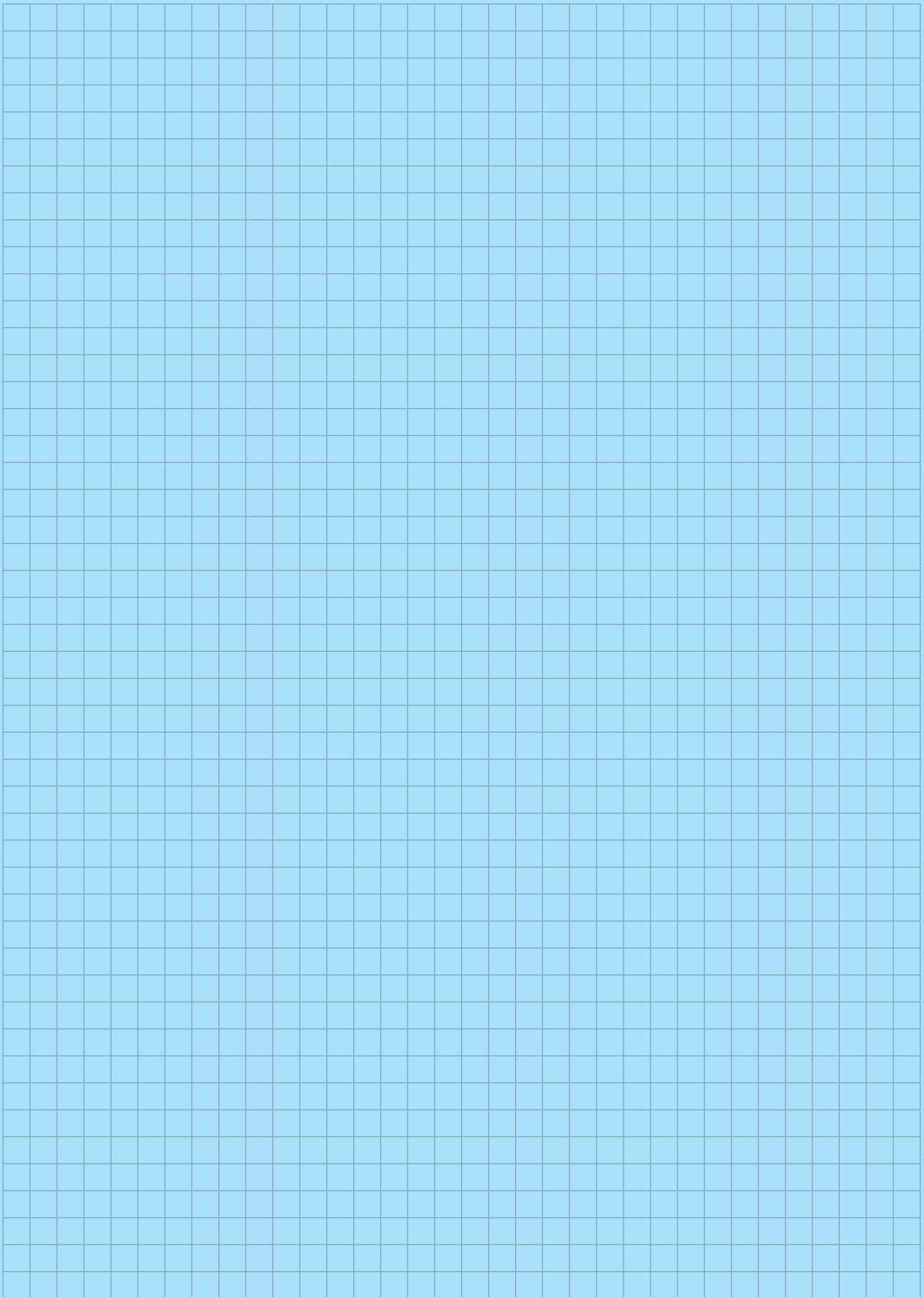


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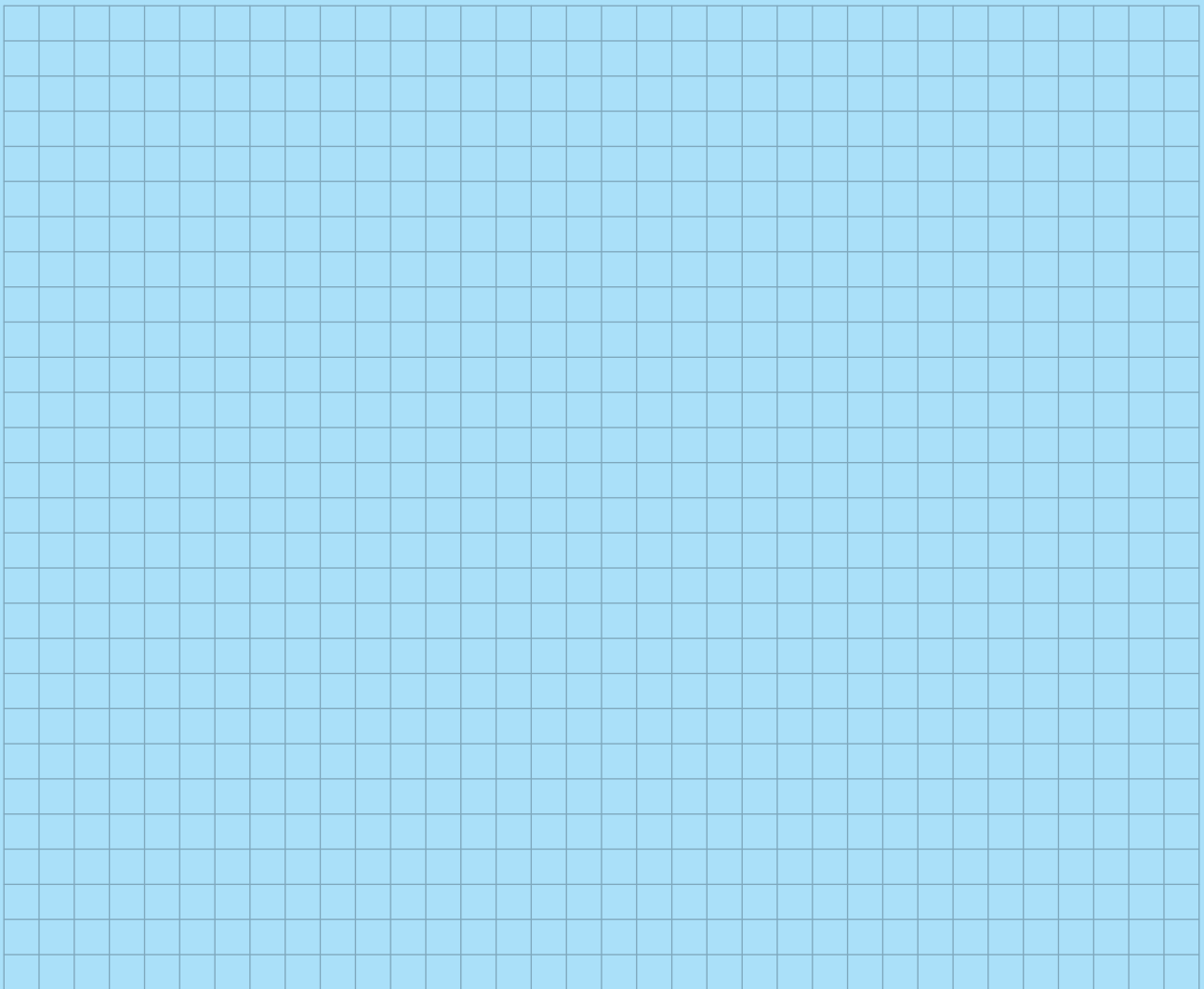
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*Note to readers of this document:*

This sample paper is intended to help teachers and candidates prepare for the June 2013 examination in *Mathematics* under Phase 2 of *Project Maths*. The content and structure do not necessarily reflect the 2014 or subsequent examinations.

Section A of the examination paper will consist of six questions, each carrying 25 marks. In accordance with the footnote in the syllabus in relation to geometry, there will be a choice within Question 6, as illustrated here.

Section B will consist of two, three, or four questions. These questions will not necessarily carry equal marks. The number of marks for each will be stated on the examination paper. The total number of marks for Section B will be 150.

Leaving Certificate 2013 – Ordinary Level

## Mathematics (Project Maths – Phase 2) – Paper 2

Sample Paper

Time: 2 hours 30 minutes