Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination
Sample Paper

Mathematics (Project Maths)

Paper 2

Ordinary Level

Time: 2 hours, 30 minutes

300 marks

Examination number

Centre stamp

Running total	

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 and 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. 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.

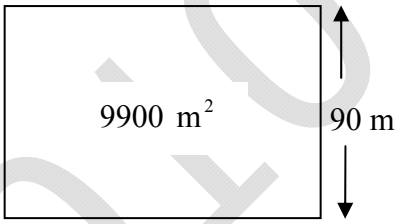
Answers should be given in simplest form, where relevant.

Section 0 Area and Volume (old syllabus) 50 marks

Answer **Question 1** from this section.

Question 1 **(50 marks)**

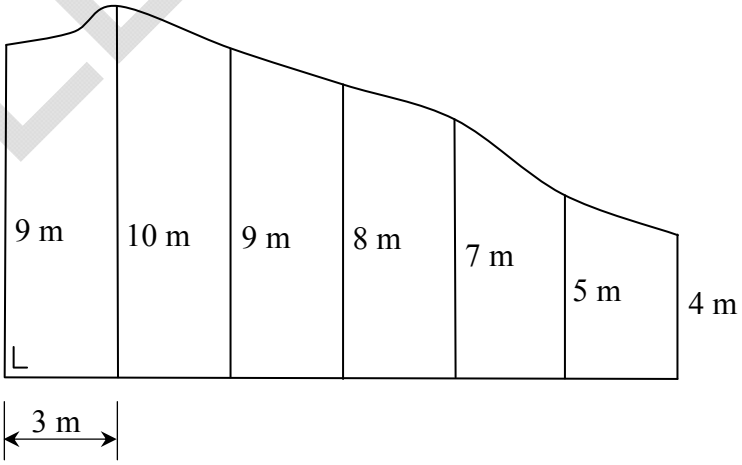
(a) The area of a rectangular playing pitch is 9900 m^2. The width of the playing pitch is 90 m.



(i) Find the length of the playing pitch.

(ii) Find the perimeter of the playing pitch.

(b) The sketch shows the garden of a house. At equal intervals of 3 m along one side, perpendicular measurements are made to the boundary, as shown on the sketch.

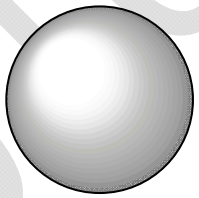


(i) Use Simpson's rule to estimate the area of the garden.

(ii) The owner of the house digs an ornamental pond in the garden. The surface area of the pond is $7\,m^2$. What percentage of the area of the garden is taken up by the pond?

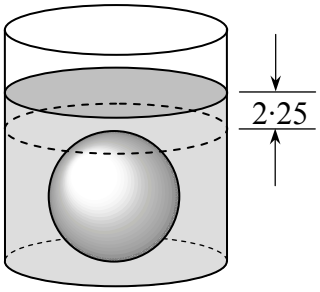
Give your answer correct to the nearest percent.

(c) **(i)** The volume of a sphere is $36\pi\ cm^3$.
Find the radius of the sphere.



(ii) When the sphere is fully immersed in a cylinder of water, the level of the water rises by 2·25 cm.

Find the radius of the cylinder.



Section A — Concepts and Skills — 125 marks

Answer **all five** questions from this section.

Question 2 (25 marks)

Measurements are taken at certain times during the course of a series of experiments.
The size, mean and standard deviation of four sets of such experimental data, A, B, C and D are given in this table:

	A	B	C	D
size (N)	1000	100	100	15
mean (μ)	9·3	113·1	1007·2	84·1
standard deviation (σ)	20·7	29·8	19·9	11·5

Complete the sentences below by inserting the relevant letter in each space:

(a) The set that contains more measurements than any other is ____ and the set that contains fewer measurements than any other is ____.

(b) On average, the data in set ____ are the biggest measurements and the data in set ____ are the smallest measurements.

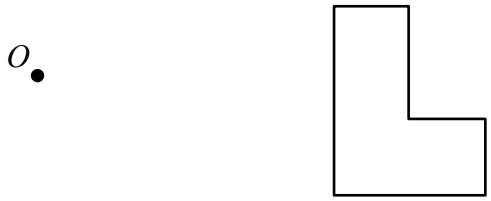
(c) The data in set ____ are more spread out than the data in the other sets.

(d) The set that is almost certain to contain some negative measurements is set ____.

(e) If the four sets are combined, the median is most likely to be a value in set ____.

Question 3 **(25 marks)**

(a) Construct the image of the shape under the enlargement with centre O and scale factor $2 \cdot 5$.



(b) Given that the area of the original shape is $3 \cdot 5$ cm^2, find the area of the image.

Question 4 **(25 marks)**

The 2006 census shows that the number of males living in Ireland is about the same as the number of females.

(a) If a person is selected at random, write down the probability that the person is male.

Answer: _____

(b) Four people are chosen at random. We are interested in whether they are male or female.

(i) Complete the sample space below showing the sixteen equally likely outcomes.

M M M M			
M M M F			

(ii) Hence, or otherwise, complete the table of probabilities below.

four males	three males; one female	two males; two females	one male; three females	four females
$\frac{1}{16}$				

(c) A person states the following: "If you pick four people at random, it's **more likely than not** that you'll get two males and two females."

Is this statement correct? Justify your answer using the answer(s) to part **(b)**.

Answer: _____

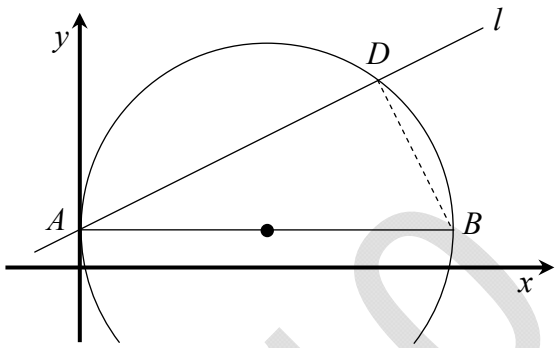
Justification:

Question 5 **(25 marks)**

(a) The point A has co-ordinates (0, 1).

The line l passes through A and has slope $\frac{1}{2}$

Find the equation of l.



(b) [AB] is the diameter of a circle, where B is the point (10, 1).

Find the centre and radius of the circle, and hence write down its equation.

Centre: (,); radius: _____ Equation: _____

(c) The line l crosses the circle at the points A and D.

Write down the slope of DB, and explain how you know that this is the slope.

Answer: The slope of DB is: _____

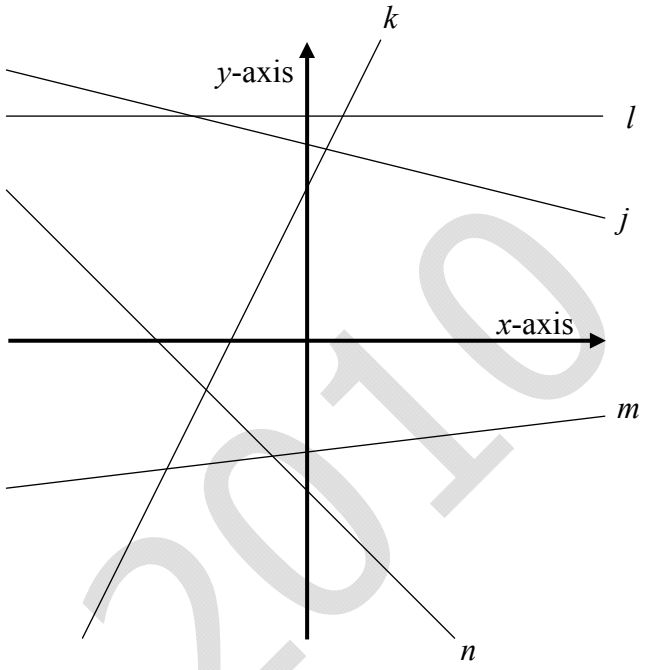
Explanation:

Question 6 **(25 marks)**

(a) Five lines j, k, l, m, and n in the co-ordinate plane are shown in the diagram.

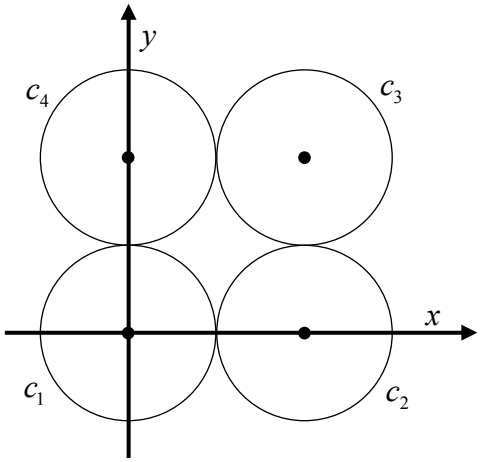
The slopes of the five lines are in the table below.

Complete the table, matching the lines to their slopes.



slope	line
2	
$\frac{1}{8}$	
0	
$-\frac{1}{4}$	
-1	

(b) The diagram shows four circles of equal radius. The circles are touching as shown.



The equation of c_1 is $x^2 + y^2 = 9$.

(i) Write down the radius of c_1.

Answer: _____

(ii) Write down the co-ordinates of the centre of c_3.

Answer: _____

(iii) Write down the equation of c_3.

Answer: _____

Section B	Contexts and Applications	125 marks

Answer Question 7, Question 8, and **either** Question 9A **or** Question 9B.

Question 7 **Probability and Statistics** **(40 marks)**

(a) The students in a Leaving Certificate class decided to investigate their heights. They measured the height of each student, in centimetres, and the results were as follows:

173	167	180	168	180	175
171	161	164	187	176	160
170	171	167	178	174	149
157	161	176	166	167	172

(i) Construct a stem and leaf plot of the above data.

Key: 14|9 = 149 cm

(ii) Describe the distribution of the data, by making **one** statement about **each** of the three characteristics indicated below.

shape of distribution:

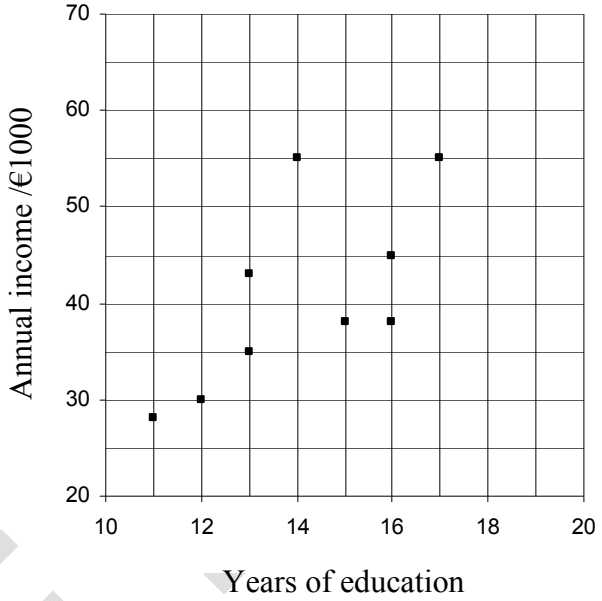
location of data (central tendency / average):

spread of data (dispersion):

(iii) State **one** additional piece of information that you would need in order to decide whether these students are unusually tall?

(b) An economics student wants to find out whether the length of time people spend in education affects how much they earn. The student carries out a small study. She asks twelve adults to state their annual income and the number of years they spent in full-time education. The data are given in the table below, and a partially completed scatter plot is given.

Years of education	Income /€1,000
11	28
12	30
13	35
13	43
14	55
15	38
16	45
16	38
17	55
17	60
17	30
19	58



(i) The last three rows of data have not been included on the scatter plot. Insert them now.

(ii) What can you conclude from the scatter plot?

(iii) The student collected the data using a telephone survey. Numbers were randomly chosen from the Dublin area telephone directory. The calls were made in the evenings, between 7 and 9 pm. If there was no answer, or if the person who answered did not agree to participate, then another number was chosen at random.

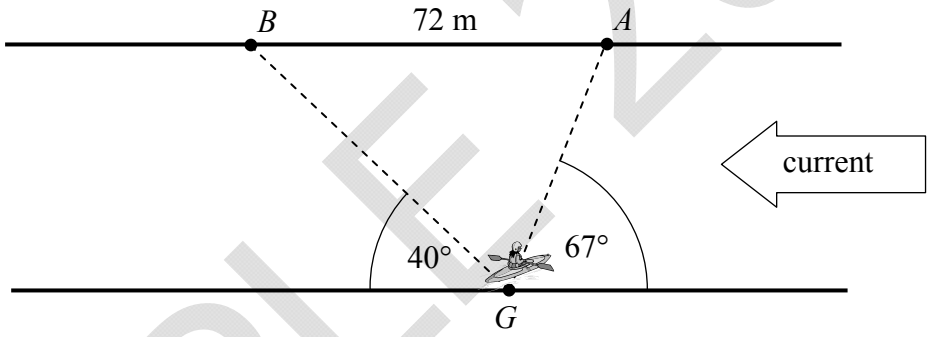
Give **one** possible problem that might make the results of the investigation unreliable. State clearly why the issue you mention could cause a problem.

Question 8 **Geometry and Trigonometry** **(40 marks)**

Gráinne has been out on a river in a kayak and has stopped at a point on one side of the river. However, she wants to get out on the other side. Looking across, she can only see two possible places to get out. One is a bit up the river from where she is now, and one is farther down the river. Because of the current, she can go faster towards the point down the river than the one up the river.

The situation is shown in the diagram below. The banks of the river are parallel. Gráinne's position is marked *G*. The places where she can get out are marked *A* and *B*. The angles are as shown. The distance from *B* to *A* is 72 metres.

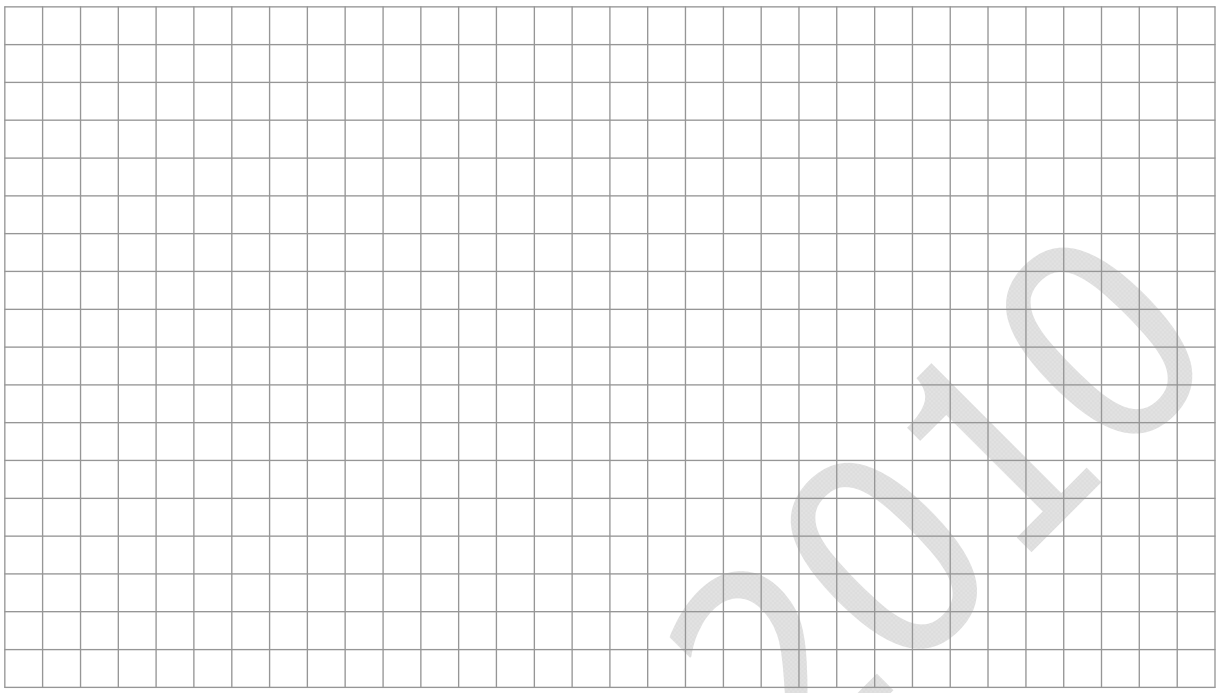
If she travels in a straight line to *A*, Gráinne can go at 0·9 m/s and if she travels in a straight line to *B* she can go at 3·2 m/s.



(a) Find the distances from *G* to *A* and from *G* to *B*.

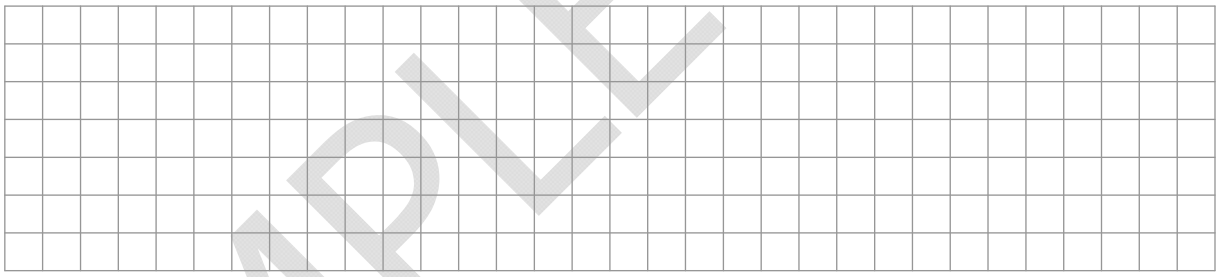
Distance from *G* to *A*:

Distance from G to B:

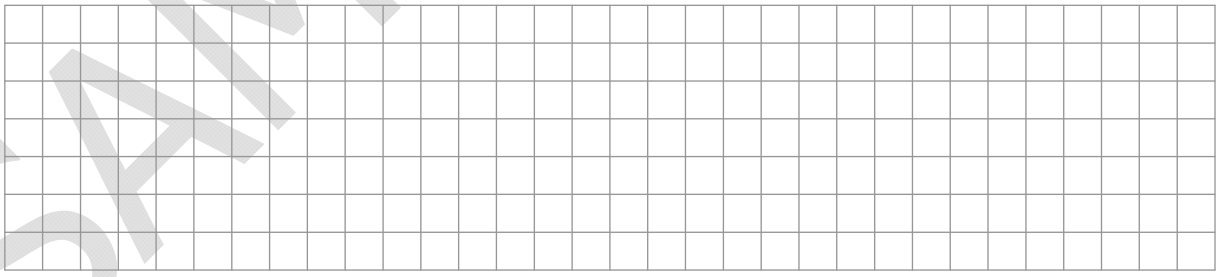


(b) Find the time it will take to cross by each route.

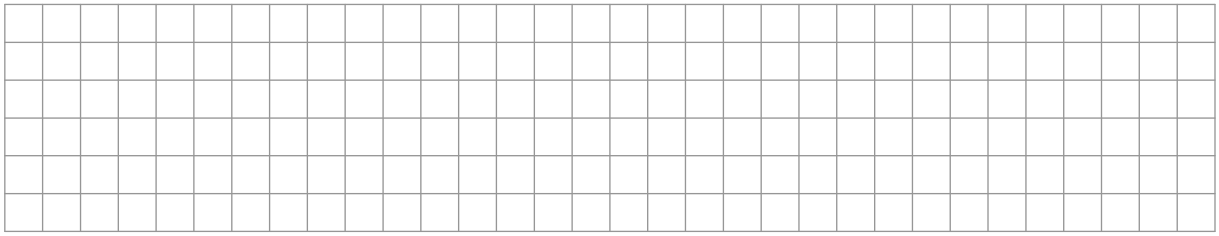
Time from G to A:



Time from G to B:



(c) Gráinne wants to get home as fast as possible. Give one possible reason why she might **not** choose the faster of the two routes across the river.



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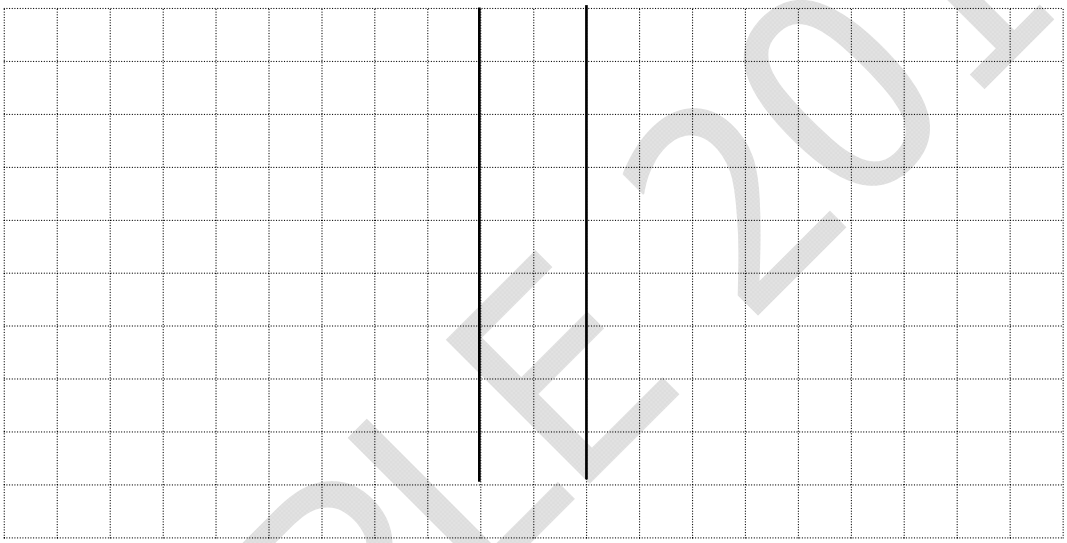
The students described in **Question 7(a)** decide to look at the heights of the boys and the girls separately. The heights of the boys and the girls in the class are given below:

Boys			Girls		
173	180	174	167	161	160
175	178	176	157	164	172
180	171	170	168	149	161
187	176	166	167	167	171

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



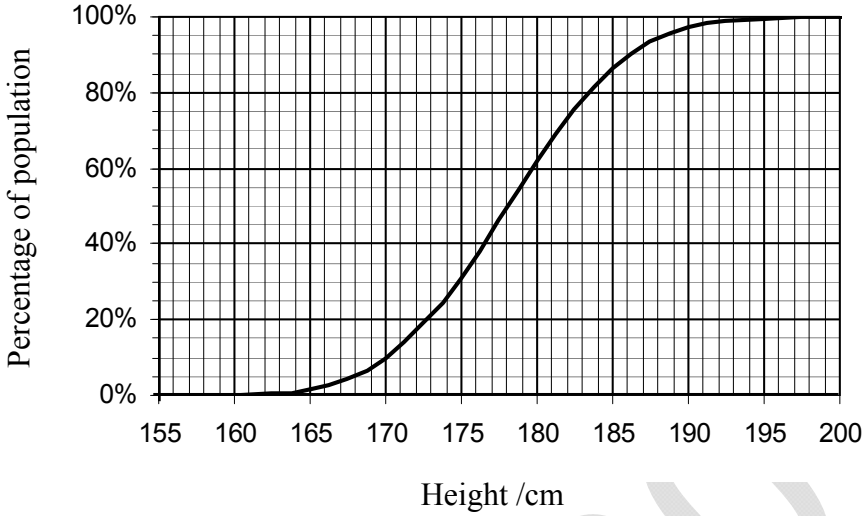
(b) State **one difference** and **one similarity** between the two distributions.

Difference:

Similarity:

(c) Assume that this class can be treated as a random sample of Leaving Certificate students. Perform a *Tukey Quick Test* on the data, stating clearly what can be concluded.

(d) The following cumulative distribution curve (ogive) represents the current heights of Irish males born in 1991.



From the curve, find the median height and the quartiles.

Median: _____ Lower quartile: _____ Upper quartile: _____

(e) The boys in the class are a *sample*. The people in part **(d)** are a *population*. Is this is a suitable population to compare the sample to? Give a reason for your answer.

Answer: _____

Reason:

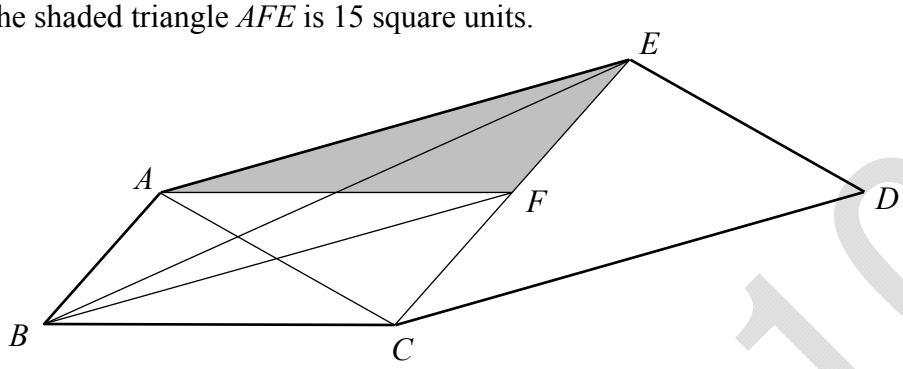
(f) Would you say that the boys in the class are taller, smaller, or about the same as the population? Use the data to justify your answer.

Answer: _____

Justification:

Question 9B **Geometry and Trigonometry** **(45 marks)**

(a) In the diagram below, *ABCF*, *ABFE*, and *ACDE* are parallelograms.
The area of the shaded triangle *AFE* is 15 square units.



(i) State why the area of triangle *AFB* must also be 15 square units.

(ii) Find the area of the whole figure *ABCDE*.
Show your work.

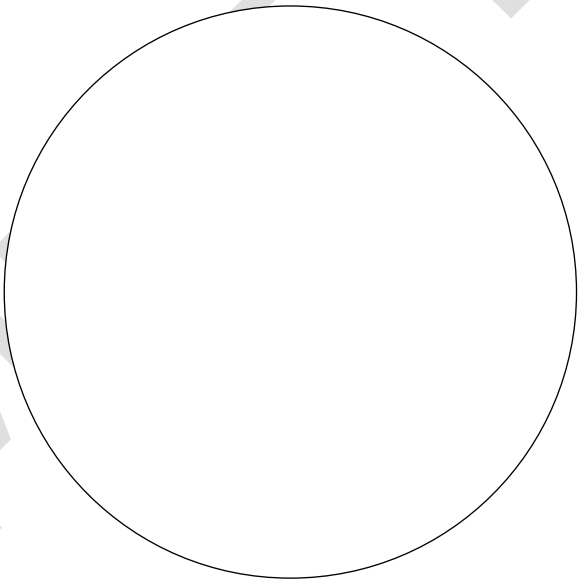
(iii) If the perpendicular distance from *D* to the line *EC* is 6, find $|AB|$.
Show your work.

(b) Dónal is making a wooden pull-along toy.
He has disks to use as wheels, but the centres are not marked on them. He needs to find the exact centre of each wheel in order to drill holes in them.

He knows that there is a geometrical method for finding the centre of a circle.

(i) State a theorem from your geometry course that could be used to locate the centre of a circle with geometrical instruments.

(ii) Find the centre of the circle below, by applying the theorem you mentioned above. Show your construction lines clearly.



(iii) Describe another way that Dónal could find the centres of the wheels.

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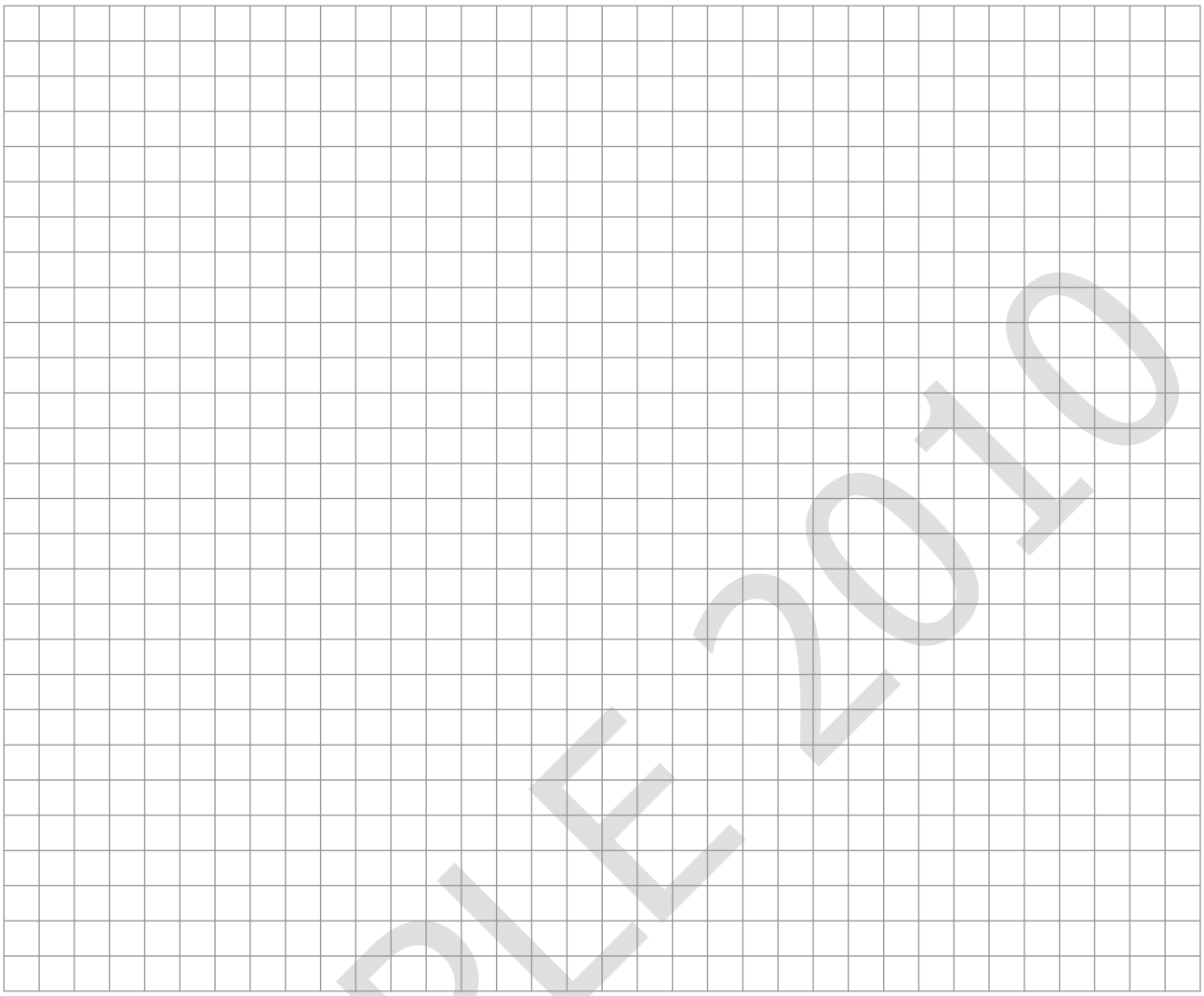

Note to readers of this document:

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

Leaving Certificate – Ordinary Level

Mathematics (Project Maths) – Paper 2

Sample Paper
Time: 2 hours 30 minutes