Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2011
Sample Paper

Mathematics
(Project Maths – Phase 2)

Paper 2

Foundation 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	
Total	

Grade

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	2 questions

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

In Section A, answer:

Questions 1 to 5 and

either Question 6A **or** Question 6B.

In Section B, answer Question 7 and Question 8.

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 A — Concepts and Skills — 150 marks

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

Question 1 (25 marks)

(a) Below is a list of experiments with random outcomes. For each one, tick (✓) the correct box to say whether the outcomes should be regarded as *equally likely* or not.

Experiment	outcomes equally likely	outcomes not equally likely
Rolling a fair die		
Tossing a bent coin		
Predicting the winner of a horse race		
Picking a card from a pack of cards		
Predicting the second ball out of the drum in a lottery		
Deciding whether it will rain tomorrow		

(b) Explain why it is easier to find the probability of an event when the experiment has *equally likely outcomes*.

Question 2 **(25 marks)**

An experiment involves asking two different people what day of the week they were born on. The outcome is recorded in this form: (day1, day2).

(a) Write out **three** possible outcomes of this experiment.

(b) How many different possible outcomes are there?

(c) Assuming that every day of the week is equally likely, answer the following.
(You may use the opposite page for extra work, if you need to.)

(i) Find the probability that both people were born on a Wednesday.

(ii) Find the probability that both people were born at the weekend (Saturday or Sunday).

(iii) Find the probability that at least one of them was born at the weekend.

Question 3 **(25 marks)**

A thousand people were at a concert. A random sample of 25 of them was selected, and the age of each person recorded. Here are the results:

25	35	28	27	31
17	21	29	11	25
27	21	18	23	21
23	18	21	16	24
19	25	22	13	28

(a) Display the data in a stem-and-leaf plot.

(b) What is the median age of the sample?

Answer: _____

(c) Based on the sample, estimate the number of people at the concert who were in their thirties.

(d) Explain why we cannot say for certain that exactly this many were in their thirties.

Question 4 **(25 marks)**

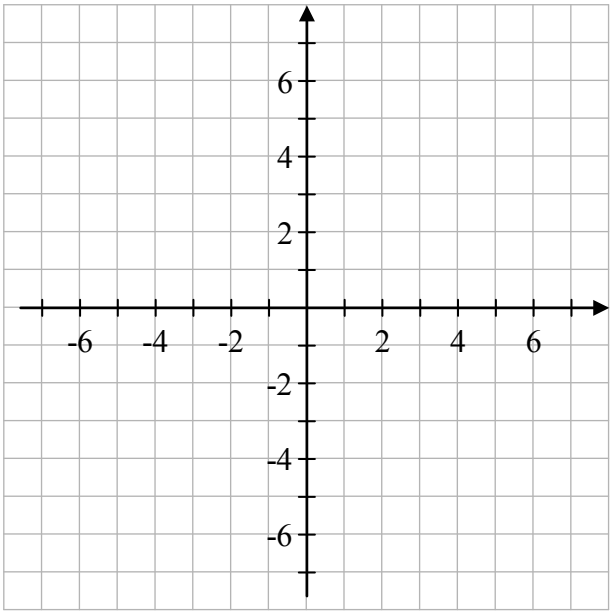
The points A, B, and C have co-ordinates as follows:

A (3, 5)

B (–6, 2)

C (5, –2)

(a) Plot A, B, and C on the diagram, and show the triangle ABC.



(b) Find the lengths of the three sides of the triangle.

$|AB| =$ _____ $|BC| =$ _____ $|CA| =$ _____

(c) Use your answers to part **(b)** to show that the triangle is **not** right-angled at A.

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Question 5 **(25 marks)**

The line l_1 passes through the points (4, 5) and (7, –1).

The line l_2 has equation $y = \frac{2}{3}x + 1$.

The line l_3 has equation $2x - 3y + 12 = 0$.

(a) Find the slopes of the three lines l_1, l_2, and l_3.

slope of l_1 = _____ slope of l_2 = _____ slope of l_3 = _____

(b) State whether any of these three lines are parallel or perpendicular to one another, giving reasons for your answers.

Question 6 **(25 marks)**

Answer **either** 6A **or** 6B.

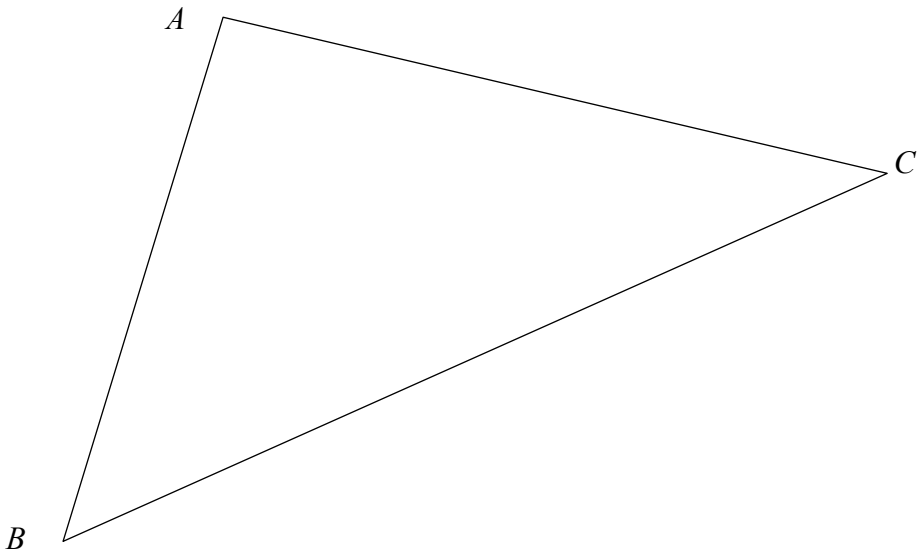
Question 6A

(a) Explain what is meant by the *circumcircle* and the *incircle* of a triangle.

The circumcircle of a triangle is…

The incircle of a triangle is…

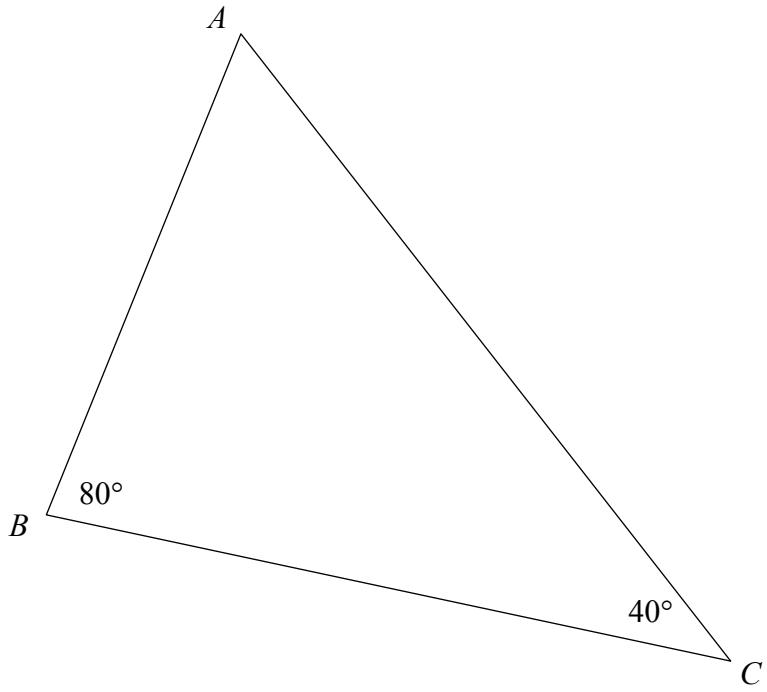
(b) Construct the *incircle* of the triangle *ABC* below, using only a compass and straight-edge. Show all construction lines.



OR

Question 6B

In the triangle ABC, $|\angle ABC| = 80°$ and $|\angle ACB| = 40°$, as shown.



(a) Construct the bisector of $\angle BAC$, without using a protractor.

(b) The bisector that you drew in part **(a)** meets the side $[BC]$ at D. Mark and label the point D.

(c) By measuring as accurately as you can, verify that $|BD| = |AC| - |AB|$.

$|BD|$ = _____, $|AC|$ = _____, $|AB|$ = _____.

Verification:

(d) Do you think that the result that you verified in part **(c)** is true for every triangle?
Justify your answer.

Section B — Contexts and Applications — 150 marks

Answer **Question 7** and **Question 8**.

Question 7 (75 marks)

(a) The *Central Statistics Office* gives estimates every year about how the population of Ireland is changing. Here is some of the information for the last five years:

Year ending April	Components of population change				
	Births	**Deaths**	**Natural increase**	**Net migration**	**Population change**
2006	61 200	27 000	34 200	71 800	106 000
2007	65 800	27 000	38 800	67 300	106 100
2008	72 300	27 700	44 600	38 500	83 100
2009	74 500	29 400	45 100	– 7 800	37 300
2010	74 100	28 200	45 900	– 34 500	11 400

Source: *Population and Migration Estimates*, CSO, September 2010

Note: The **Net migration** column shows the number of people who came to live in Ireland minus the number who left.

(i) Which **one** of the following statements about the total population is true? Write the letter corresponding to the correct answer in the box.

A. The population has been falling for the last few years
B. The population has been rising faster and faster every year
C. The population is rising, but more slowly than a few years ago
D. The population rose in some years and fell in other years.

(ii) The population in April 2006 was 4·240 million. What was it in April 2007?

(ii) Explain how the numbers in the **Natural increase** column are related to the numbers in the **Births** and **Deaths** columns.

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(iii) The number of people who **left** Ireland in the year ending April 2010 was about the same as it was the year before. What can you say about the number of people who **came** to Ireland in the year ending April 2010?

(iv) In your opinion, what is the most notable feature of the information in the table. Explain your answer.

(v) Seán says: "The average increase in the population over the last five years is about 69 000 people…"

Verify that Seán's calculation is correct.

(vi) Seán goes on to say: "…so I expect that there will be about 69 000 more people in Ireland by April 2011."

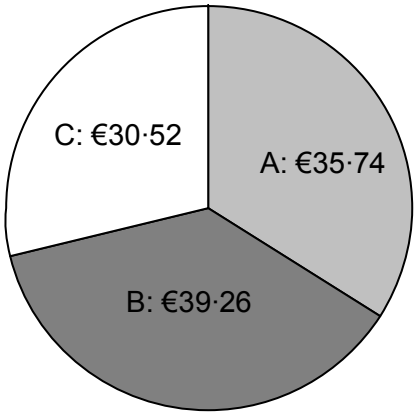
Is Seán's conclusion reasonable? Explain your answer.

(vii) Name **one** source of data that the *Central Statistics Office* might have used in order to get some of the information in the table.

(b) Jane wanted to compare prices in three different supermarkets. She did a survey of prices for a shopping basket of certain goods in the supermarkets. The total price of the goods in the basket is as follows:

Supermarket A	Supermarket B	Supermarket C
€35·74	€39·26	€30·52

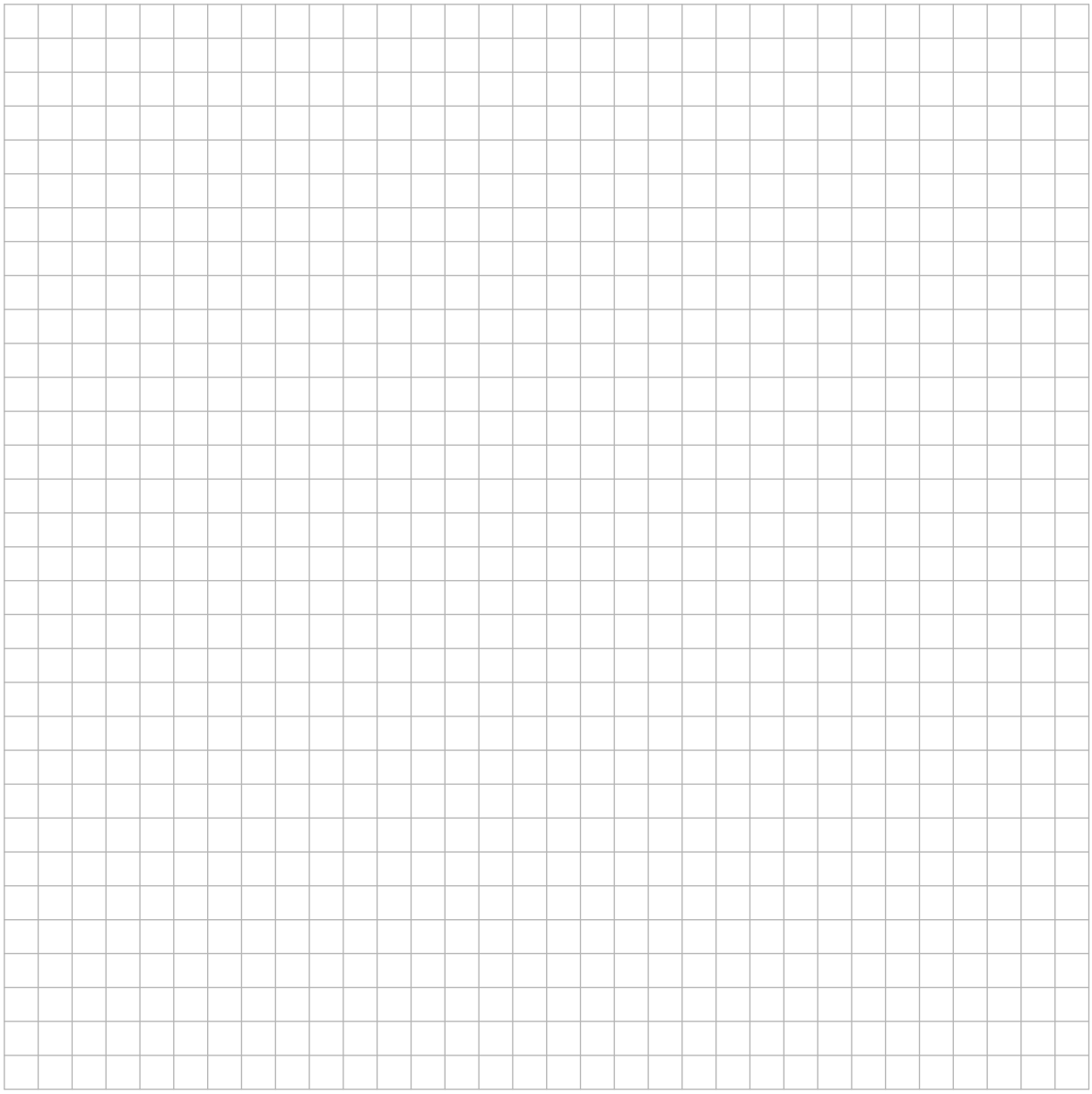
Jane decided to display the results of her survey as a pie chart. Her chart is shown below.



Price of basket of goods

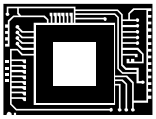
(i) Explain why a pie chart is **not** a good way to display this information.

(ii) Use a different type of chart to display the results in a better way.



Question 8 **(75 marks)**

(a) A pattern for a circuit board was reduced in size using an enlargement by the ray method. Because the pattern was made smaller, the *scale factor* is less than 1. The diagram below shows the pattern before and after the reduction.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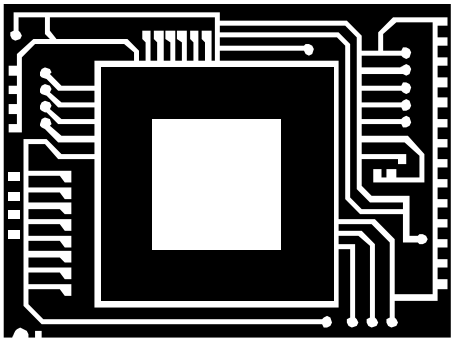
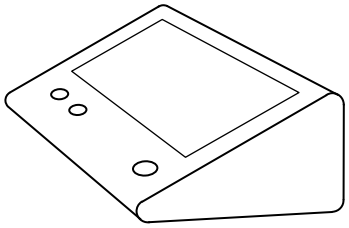

original

(i) On the diagram, find the centre of enlargement.

(ii) By measurement and calculation, find the scale factor of the enlargement.

(iii) The area of the original pattern is 27 cm^2. Find the area of the image.

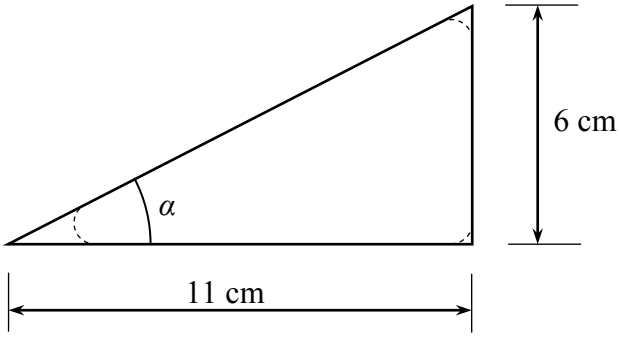
(b) The circuit board is for an electronic game.



The side panel of the game is approximately triangular.

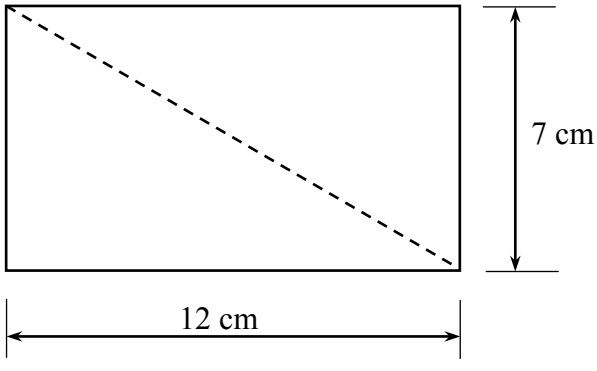
The drawing below is for the side panel.

The measurements are as shown.



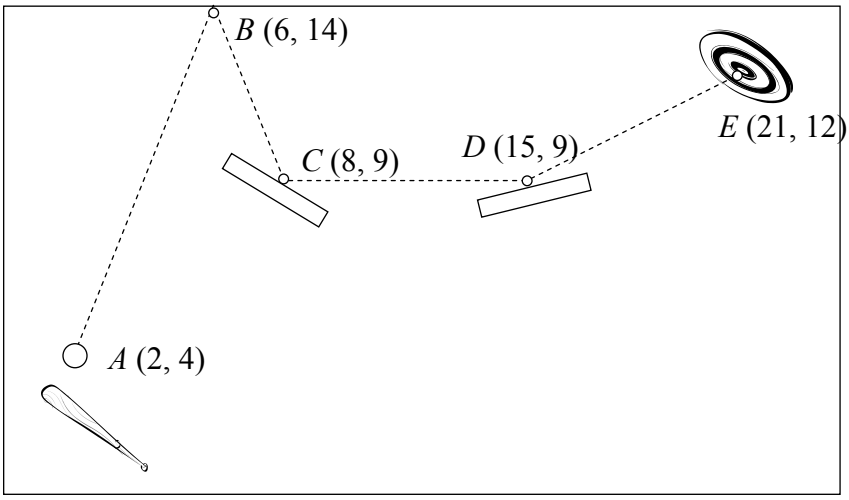
Find $|\angle\alpha|$, correct to the nearest degree.

(c) The screen measures 7 cm by 12 cm.
Find the length of the diagonal of the screen.



(d) One of the games involves hitting a ball around the screen with a bat. The positions of objects on the screen are described with co-ordinates.

The diagram shows the path of a ball from when it is hit at A until it hits a target at E.



(i) Find the distance from A to B.

(ii) Show that the slope of BC is the negative of the slope of AB.

(iii) The slope of DE is $\frac{1}{2}$. Find the equation of DE.

(iv) Show that A is **not** on the line DE.

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You may use this page for extra work

You may use this page for extra work

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Note to readers of this document:

This sample paper is intended to help teachers and candidates prepare for the June 2011 examination in the *Project Maths* initial schools. The content and structure do not necessarily reflect the 2012 or subsequent examinations in the initial schools or in all other schools.

Leaving Certificate 2011 – Foundation Level

Mathematics (Project Maths – Phase 2) – Paper 2

Sample Paper
Time: 2 hours 30 minutes