Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2012
Sample Paper

Mathematics
(Project Maths – Phase 3)

Paper 1

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.

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.

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

Section A — Concepts and Skills — 150 marks

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

Question 1 (25 marks)

(a) Write 6^3 and $81^{\frac{1}{2}}$ without using indices.

$6^3 =$

$81^{\frac{1}{2}} =$

(b) Simplify $\dfrac{a^3a^5}{a^2}$.

(c) Express 2^{24} in the form $a\times10^n$, where $1\le a<10$ and $n\in\mathbb{N}$, correct to three significant figures.

(d) The mass of Jupiter is $1{\cdot}90\times10^{27}$ kg and the mass of the earth is $5{\cdot}97\times10^{24}$ kg. How many times greater is the mass of Jupiter than the mass of the earth?

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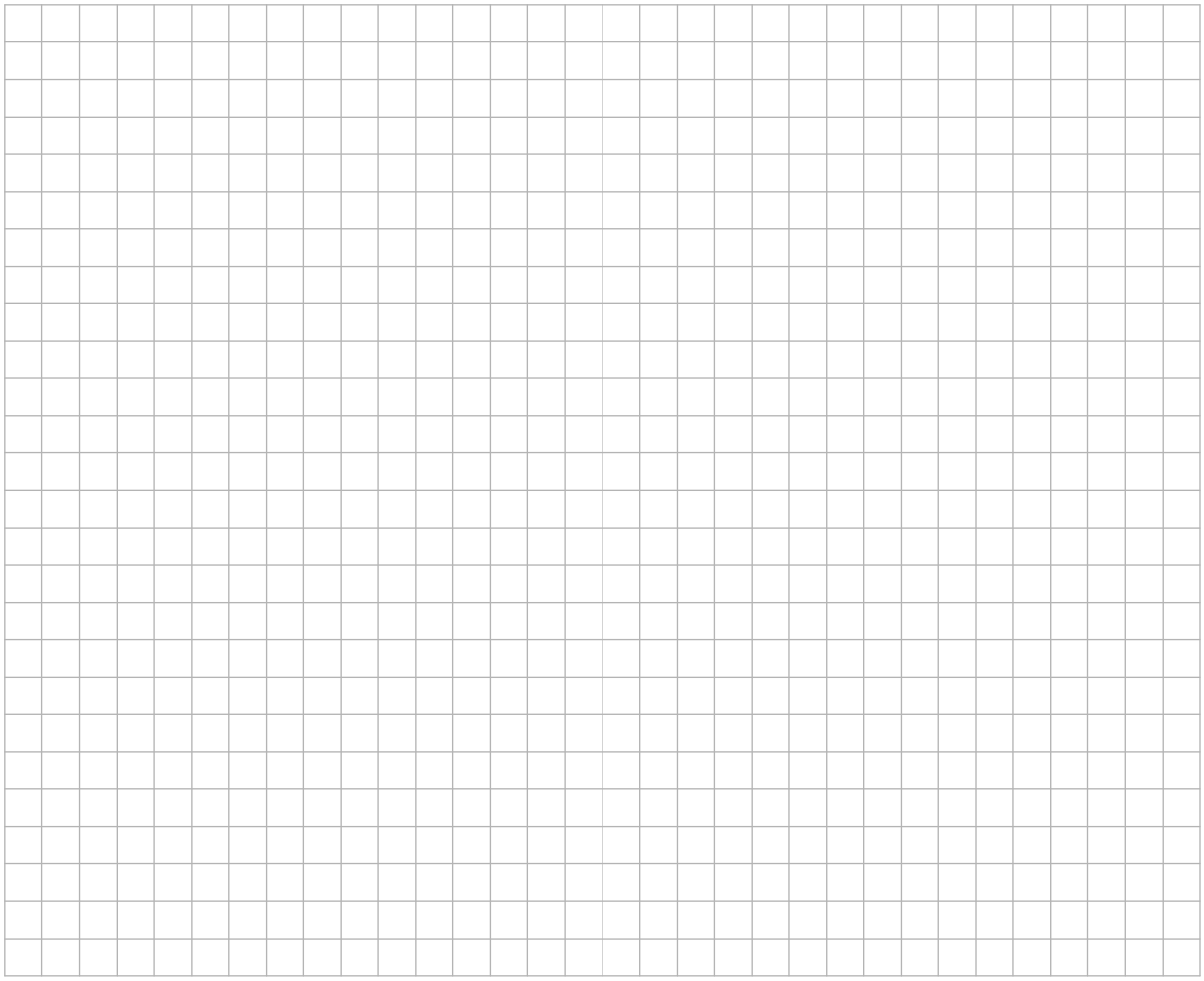
Question 2 **(25 marks)**

(a) Write 6% as a decimal.

Answer: _____

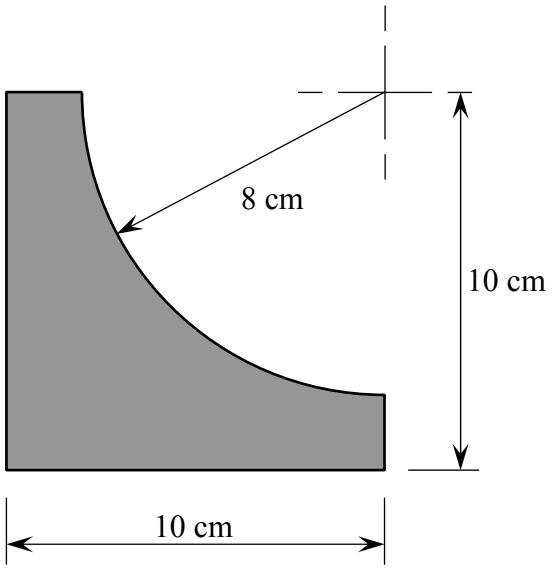
(b) A sum of €5000 is invested in an eight-year government bond with an annual equivalent rate (AER) of 6%. Find the value of the investment when it matures in eight years' time.



Question 3 **(25 marks)**

(a) The shape shown in the diagram is a square from which a quarter of a disc has been removed.

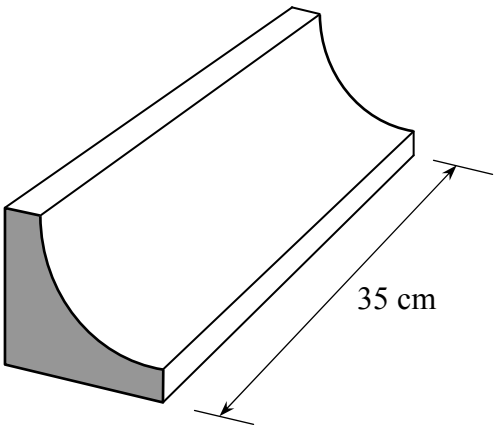
Find the area of the shape, in cm^2, correct to two decimal places.



(b) The solid object shown is 35 cm long.

Its cross-section has the dimensions of the shape in part **(a)**.

Find its volume, correct to the nearest cm^3.



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Question 4 **(25 marks)**

(a) Evaluate $\frac{4h-2k}{3h+k}$ when $h=3$ and $k=1$.

(b) Solve the simultaneous equations

$$2x-3y=2$$
$$3x+5y=41$$

Question 5 **(25 marks)**

(a) Solve the equation $x^2 - 7x + 6 = 0$.

(b) Solve the equation $t^2 - 6t - 23 = 0$, giving your answers correct to two decimal places.

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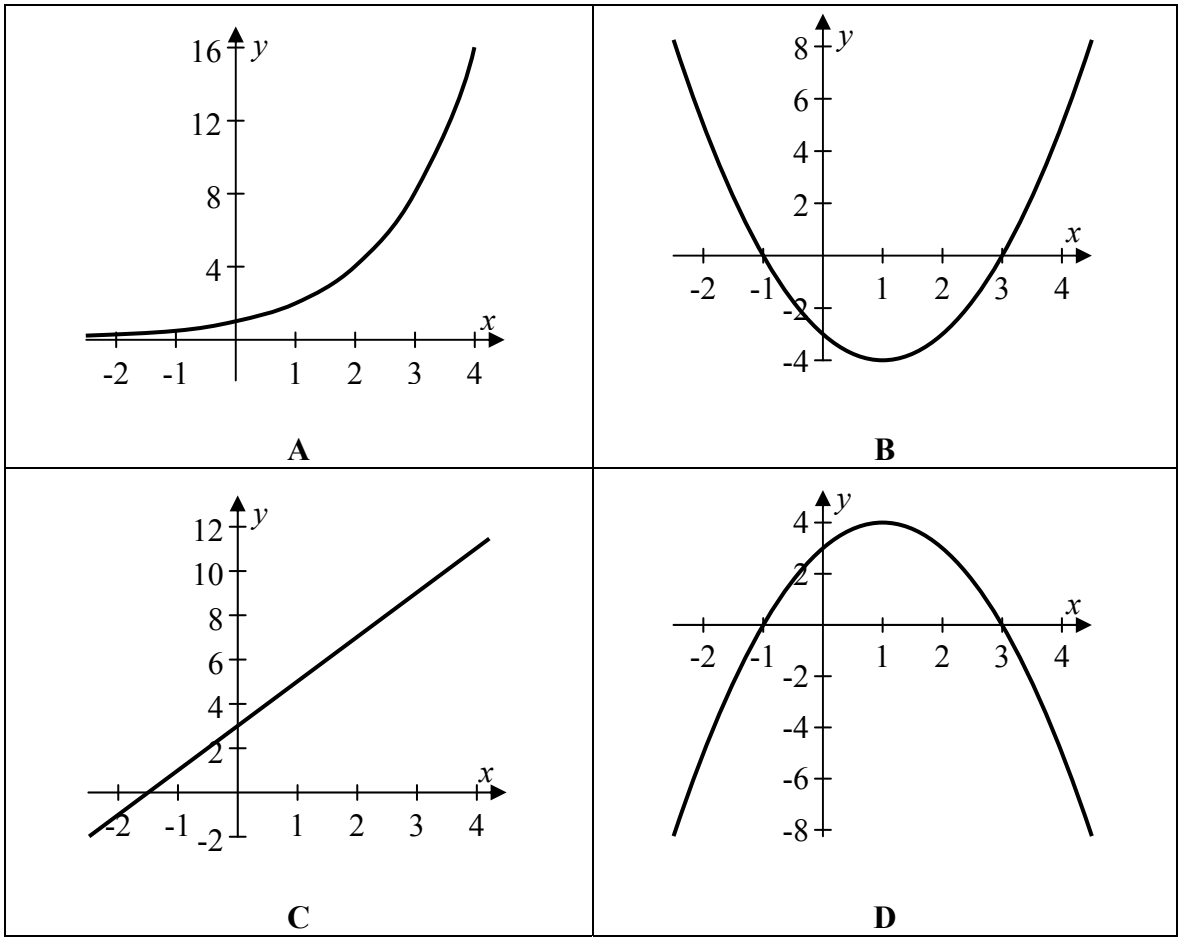
Question 6 **(25 marks)**

(a) The graphs of four functions are shown below. The graphs are labelled **A**, **B**, **C**, and **D**.
The four functions are listed in the table beneath the graphs.
Match the graphs to the functions, by putting the correct letter beside each one in the table.



Function	Graph
$f(x) = 2x + 3$	
$g(x) = (x - 3)(x + 1)$	
$h(x) = 2^x$	
$j(x) = 3 + 2x - x^2$	

(b) For any **one** of the functions above, explain how you decided on your answer.

Section B — Contexts and Applications — 150 marks

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

Question 7 (75 marks)

(a) Mark is doing a science experiment. He starts with 40 fruit flies in a large jar, with plenty of suitable food. He counts the number of fruit flies in the jar every six days for several weeks. The results are in the following table.

Time in days	0	6	12	18	24	30
Number of flies	40	57	80	114	160	228

(i) Describe the pattern in the growth of the number of flies.

(ii) Suppose that this pattern continued. Complete the table below for the next four observations.

Time in days	36	42	48	54
Number of flies				

(iii) Do you think that this pattern could continue for ever? Explain your answer.

(b) Róisín was trying to calculate the volume of a tin of beans. She measured the diameter and used it to find the radius. She measured the height. Then she used the formula $V = \pi r^2 h$.

The answer Róisín got was 485 000 cm^3. She knows that she must have made a mistake.

(i) Explain why Róisín knows that she made a mistake.

(ii) Roughly, what answer do you think Róisín should have got?

(iii) Róisín's calculations are shown here.

Explain the mistake she made.

$d = 76$ mm, so $r = 38$

$h = 107$

$\pi r^2 h = (3{\cdot}14)(38)^2(107)$

$= 485{,}155{\cdot}12$

$\approx 485{,}000\ cm^3$.

(c) An extract from an electricity bill is shown.
Some of the numbers are missing, and are labelled (A), (B), (C), (D), (E), (F).

METER NO.	METER READINGS		ELECTRICITY USED	METER READING TYPES
	PRESENT	PREVIOUS	kWh	
Z0000001234	8020 A	7053 C	(A)	A: Actual reading C: Customer reading E: Estimated reading

Discount Tariff – Urban Day

Description	Units	Rate	AMOUNT €
Standing charge	61 days	25.20 cent/day	(B)
24 hour units	(C)	14.10 cent/kWh	136.35
Direct debit discount		12%	15.99 CR
Total excluding V.A.T.			(D)
V.A.T. at 13.5%			(E)

PLEASE PAY BY	TOTAL €
Direct Debit 21 Sept 10	(F)

Calculate the missing numbers, and insert them in the table below.

A	B	C	D	E	F

Question 8 **(75 marks)**

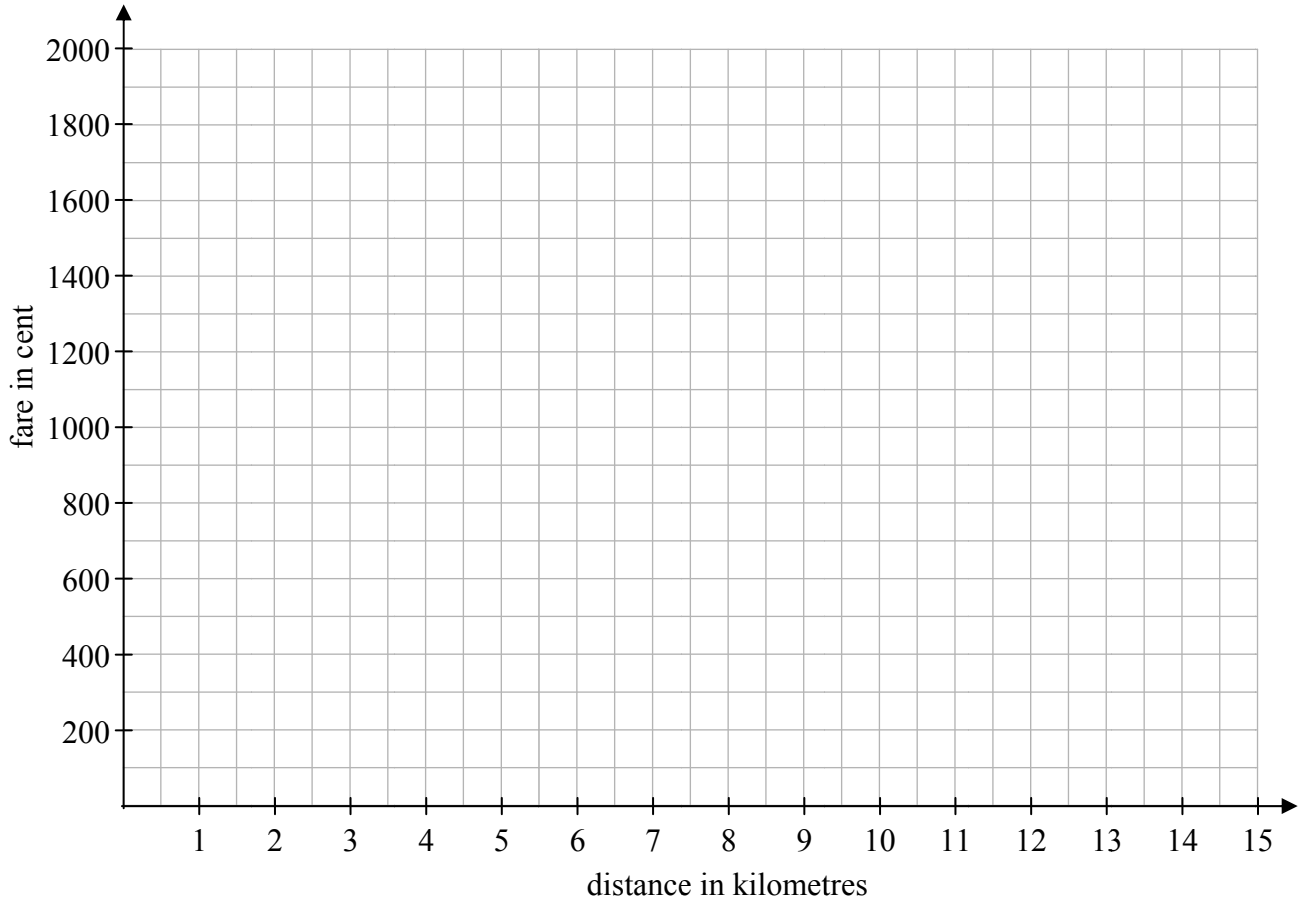
The fare for a taxi journey often depends only on the distance travelled. In such cases, for journeys up to 15 km, the fare is as follows:

- A fixed charge of €4·10 for the first kilometre, and
- A further charge of €1·03 per kilometre thereafter.

(a) Complete the table below showing the fare, **in cent**, for some journeys from 1 km to 15 km.

Distance (/km)	1	2	3	4	5	10	15
Fare (/cent)	410						

(b) Draw a graph to represent the taxi fare from 1 km up to 15 km.



(c) John needs to travel 3·7 km to get home. Use the graph to work out how much his taxi fare will be, in euro.

Answer: _____

(d) Mary has €10·00. Use the graph to work out how far she will be able to travel by taxi.

Answer: _____

(e) Write down a formula to represent the fare for any given distance in this range. State clearly the meaning of any letters used in your formula.

(f) Use your formula from part **(e)** to verify your answers to parts **(c)** and **(d)**.

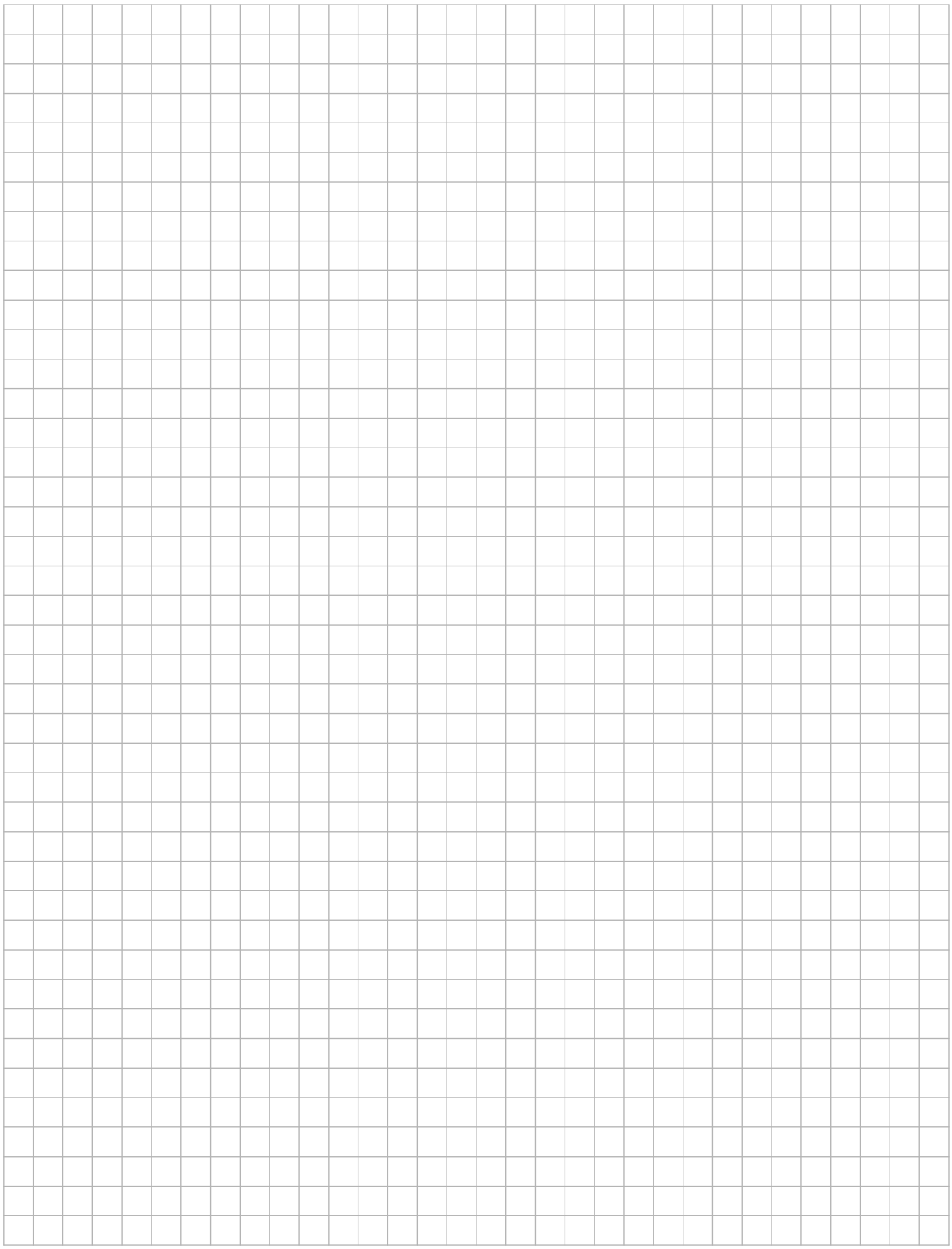
(g) After the first fifteen kilometres, the rate goes up to €1·35 per kilometre. Give a reason that could justify this increase.

(h) Suppose that there is a suggestion to change the way that taxi fares are calculated. The suggestion is that the fare should be calculated using the formula:

$$f = 200 + 10d^2,$$

where f is the fare in cent and d is the distance travelled, in kilometres.

We want to see how fares worked out with this rule would compare to the old fares.
Using tables, graphs, or otherwise, work out which journeys, if any, would be cheaper with the new rule.



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 2012 examination in the *Project Maths* initial schools. The content and structure do not necessarily reflect the 2013 or subsequent examinations in the initial schools or in all other schools.

Leaving Certificate 2012 – Foundation Level

Mathematics (Project Maths – Phase 3) – Paper 1

Sample Paper
Time: 2 hours 30 minutes