Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination 2014
Sample Paper

Mathematics
(Project Maths – Phase 2)

Paper 1

Ordinary Level

Time: 2 hours

300 marks

Examination number

Centre stamp

Running total	

For examiner			
Question	Mark	Question	Mark
1		11	
2		12	
3		13	
4		14	
5			
6			
7			
8			
9			
10		Total	

Grade

Instructions

There are 14 questions on this examination paper. Answer **all** questions.

Questions do not necessarily carry equal marks. To help you manage your time during this examination, a maximum time for each question is suggested. If you remain within these times you should have about 10 minutes left to review your work.

Question 14 carries a total of 50 marks.

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

You will lose marks if all necessary work is not clearly shown.

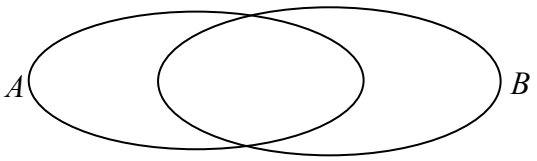
Answers should include the appropriate units of measurement, where relevant.

Answers should be given in simplest form, where relevant.

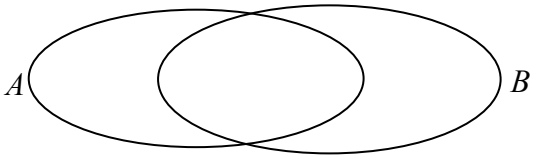
Write the make and model of your calculator(s) here:

Question 1 **(Suggested maximum time: 5 minutes)**

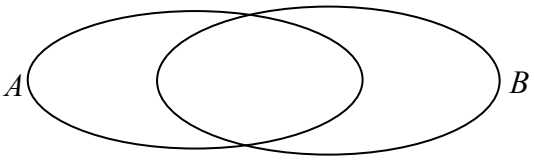
(i) On the Venn diagram below, shade the region that represents $A \cup B$.



(ii) On the Venn diagram below, shade the region that represents $A \setminus B$.



(iii) Using your answers to **(i)** and **(ii)** above, or otherwise, shade in the region $(A \cup B) \setminus (A \setminus B)$.



(iv) If A represents the students in a class who like apples and B represents the students in the same class who like bananas, write down what the set $A \setminus B$ represents.

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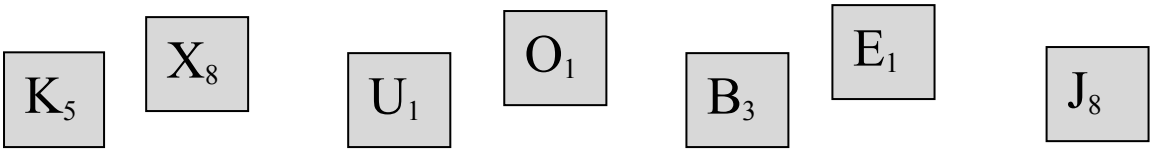
Question 2 **(Suggested maximum time: 5 minutes)**

In the game of *Scrabble*, players score points by forming words from individual lettered tiles and placing them on a board. The points for each letter are written on the tile. To find the total score for a word, a player adds together the points for each tile used.

In a game, Maura selects these seven tiles.



She then arranges them to form the word below.

J_8	U_1	K_5	E_1	B_3	O_1	X_8

(i) Find the total number of points that Maura would score for the above word.

Certain squares on the board can be used to gain extra points for letters or words. The scores for the letters are calculated first. Part of one line of the board is shown below. Maura places her word on this line with one letter in each adjacent box.

(ii) Maura places her word on the board below in a way that gives the maximum possible score. Show how she does this.

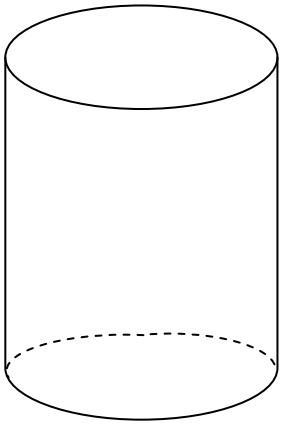
			Double letter score				Double word score				Double letter score

(iii) Maura also gets a bonus of 50 points for using all her letters. Find the total number of points that Maura scores for this word.

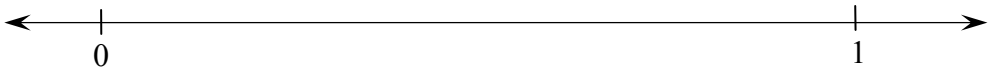
Question 3 **(Suggested maximum time: 5 minutes)**

(i) Write $\frac{3}{8}$ as a decimal.

(ii) Show the approximate height of water in the glass if the glass is $\frac{3}{8}$ full.



(iii) Represent the numbers $\frac{3}{8}$ and $0{\cdot}4$ on the number line below.



(iv) How could the number line in **(iii)** above help you decide which is the bigger of the two numbers?

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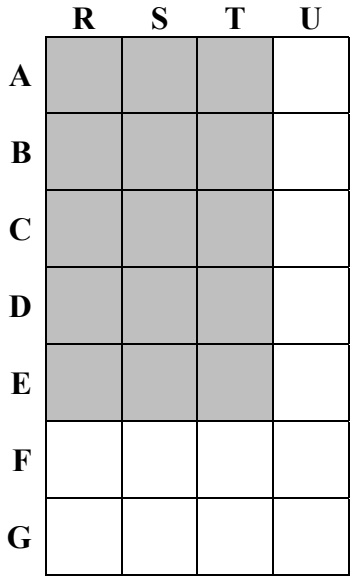
Question 4 **(Suggested maximum time: 5 minutes)**

(a) **(i)** In the diagram below what fraction of row **A** is shaded?



(ii) In the same diagram what fraction of column **R** is shaded?

(iii) Using the diagram, or otherwise, calculate the result when your fractions in part **(i)** and part **(ii)** are multiplied.

$\frac{\quad}{\quad} \times \frac{\quad}{\quad} = \frac{\quad}{\quad}$

(b) Tim claims that the two fractions shown by the shading of the strips **A** and **B** below are the same. Is Tim correct? Give a reason for your answer.

Answer:

Reason:

A

B

Question 5 **(Suggested maximum time: 10 minutes)**

Dermot has €5,000 and would like to invest it for two years. A special savings account is offering an annual interest rate of 4% if the money remains in the account for the two years.

(i) Find the interest he would earn in the first year.

(ii) Tax of 33% will be deducted each year from the interest earned. Find the tax (33%) on the **interest** from part **(i)**.

(iii) Find the amount of the investment at the start of the second year.

€5,000 + Interest – Tax =

(iv) Find the total amount of Dermot's investment at the end of the second year, after the tax is deducted from the interest. Give your answer correct to the nearest euro.

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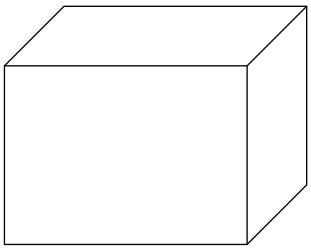
Question 6 **(Suggested maximum time: 5 minutes)**

(i) A rectangular solid is 24·9 cm long, 20·3 cm wide, and 19·6 cm high. By rounding off appropriately, select which of the values **A**, **B**, **C**, or **D** is the best estimate for the volume of the solid.



A	B	C	D
1000 cm^3	100 cm^3	10 000 cm^3	65 cm^3

Estimation:

Best estimate:

(ii) Using a calculator, or otherwise, calculate the exact volume of the solid in cm^3.

Question 7 **(Suggested maximum time: 5 minutes)**

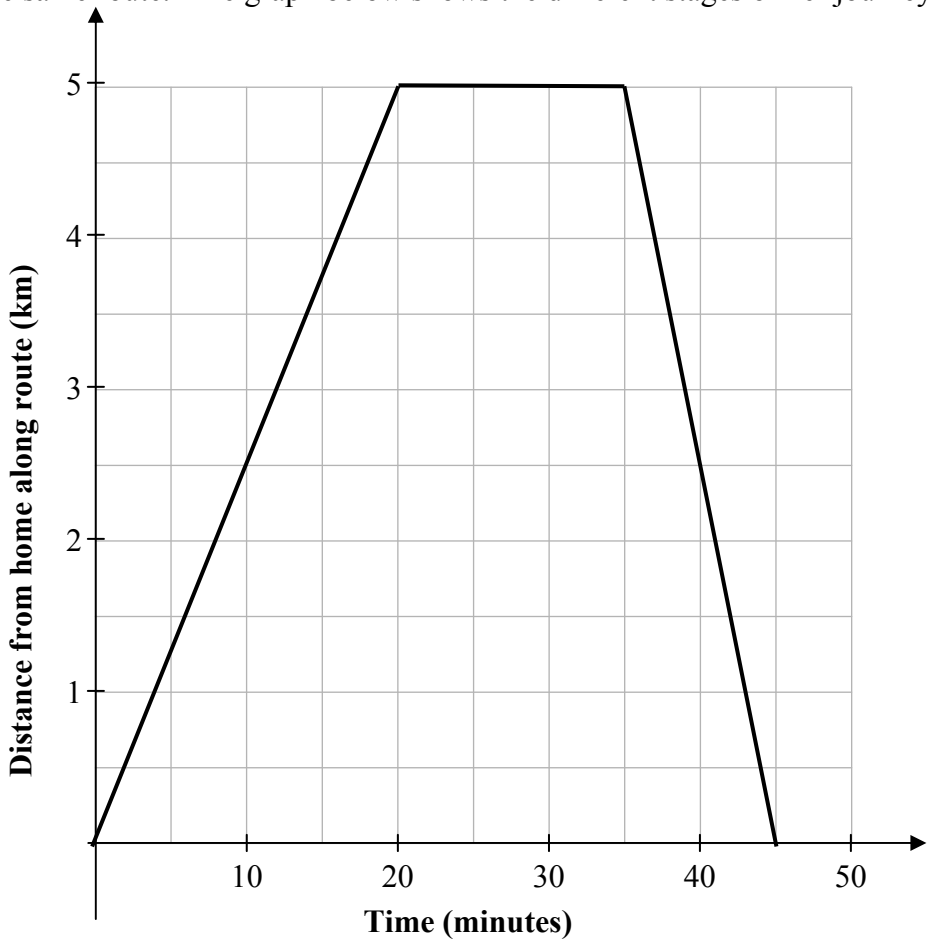
(a) Write $2\times2\times2\times2\times2\times2$ in the form 2^x where $x\in\mathbb{N}$. $2^{\square}$

(b) If $a^p\times a^3=a^8$, write down the value of p. $p=$ _____

(c) Simplify $\dfrac{2^5\times2^6}{2^4\times2^3}$.

Question 8 **(Suggested maximum time: 10 minutes)**

Olive cycled to the shop to get some milk for her tea. She cycled along a particular route and returned by the same route. The graph below shows the different stages of her journey.



(i) How long did Olive stay in the shop? _____

(ii) How far from her home is the shop? _____

(iii) Compare the speed of her trip to the shop with her speed on the way home.

(iv) Write a paragraph to describe her journey.

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Question 9 **(Suggested maximum time: 10 minutes)**

Tina is standing beside a race-track. A red car and a blue car are travelling in the same direction at steady speeds on the track. At a particular time the red car has gone 70 m beyond Tina and its speed is 20 m/s. At the same instant the blue car has gone 20 m beyond Tina and its speed is 30 m/s.

(i) Complete the table below to show the distance between the red car and Tina and the blue car and Tina during the next 9 seconds.

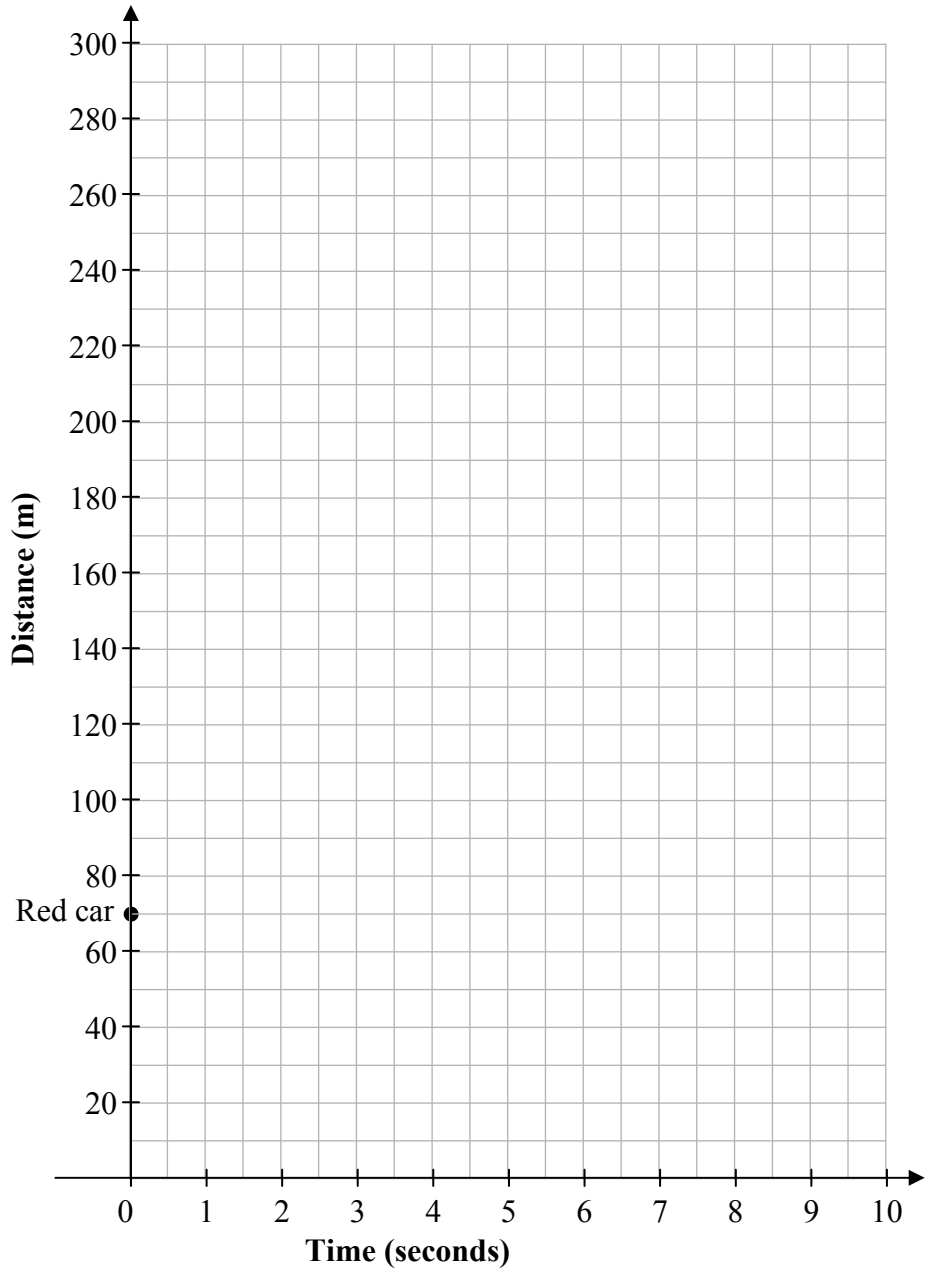
Time	**Red Car Distance (m)**	**Blue Car Distance (m)**
0	70	20
1	90	50
2		
3		
4		
5		
6		
7		
8		
9		

(ii) After how many seconds will both cars be the same distance from Tina? _____

(iii) After 8 seconds which car is furthest away from Tina and how far ahead of the other car is it?

Furthest from Tina =	
Distance between cars =	

(iv) On the diagram on the next page draw graphs of the distance between the red car and Tina and the distance between the blue car and Tina over the 9 seconds.



(v) Write down a formula to represent the distance between the red car and Tina for any given time. If you use any letters in your formula, you should state clearly what each one means.

(vi) Write down a formula to represent the distance between the blue car and Tina for any given time.

_____

(vii) Use your formulas from **(v)** and **(vi)** to verify the answer that you gave to part **(ii)** above.

Question 10 **(Suggested maximum time: 5 minutes)**

(i) John is three times as old as Mary. Mary's age in years is represented by x. Select one expression from **A**, **B**, **C**, **D**, and **E** below which represents John's age in years.

A	B	C	D	E
$x+3$	$3x$	$3x+3$	$3x+9$	$x-3$

Expression: _____

(ii) Select one expression from **A**, **B**, **C**, **D**, and **E** above which represents John's age in three years' time.

Expression: _____

(iii) Select one expression from **A**, **B**, **C**, **D**, and **E** above which represents Mary's age in three years' time.

Expression: _____

(iv) In three years' time, John's age added to Mary's age will give a total of 26 years. Write down an equation in x to represent this statement.

Equation:

(v) Solve your equation to find Mary's present age.

Mary's age =

Question 11 **(Suggested maximum time: 5 minutes)**

(i) 1000 people attended a concert. Of these, x were adults and y were children. Use this information to write an equation in x and y.

Equation 1:

(ii) An adult's ticket cost €10 and a child's ticket cost €5. The total amount collected through ticket sales was €8,750. Use this information to write another equation in x and y.

Equation 2:

(iii) Solve your two equations to find the number of adults and the number of children who attended the concert.

Question 12 **(Suggested maximum time: 10 minutes)**

(a) Find the value of the expression $\frac{2x+1}{3}+\frac{3x-5}{2}$ when $x = 7$.

$$\frac{2(\ \ )+1}{3}+\frac{3(\ \ )-5}{2} =$$

(b) Express $\frac{2x+1}{3}+\frac{3x-5}{2}$ as a single fraction. Give your answer in its simplest form.

$$\frac{2x+1}{3}+\frac{3x-5}{2} =$$

(c) Suggest a method to check that your answer to **(b)** above is correct. Perform this check.

Method:

Check:

(d) Solve the equation $\frac{2x+1}{3}+\frac{3x-5}{2}=\frac{13}{2}$.

Question 13 **(Suggested maximum time: 10 minutes)**

Some students are asked to write down linear and quadratic expressions that have $(x + 2)$ as a factor.

(a) The expressions $3x + 5$, $x + 1$, and $2x - 10$ are examples of *linear* expressions in x. Write down a linear expression in x, other than $x + 2$, that has $x + 2$ as a factor.

(b) Anton writes down a quadratic expression of the form $x^2 - k$, where k is a number. For what value of k will Anton's expression have $x + 2$ as a factor?

(c) To get her quadratic expression, Denise multiplies $x + 2$ by $2x + 3$. Find Denise's expression.

$(x+2)(2x+3) =$

(d) **(i)** Fiona's expression is $3x^2 + 11x + 10$. She uses division to check if $x + 2$ is a factor of it. Explain how division will allow her to check this.

(ii) Divide $3x^2 + 11x + 10$ by $x + 2$.

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(e) Write down one quadratic expression, other than those already given above, that has $x + 2$ as a factor.

Question 14 **(Suggested maximum time: 20 minutes)**

(a) $f(x) = 3x - 5$. Find:

(i) $f(7)$

(ii) $f(-1)$

(b) **(i)** Draw the graph of the function $g : x \mapsto 2x^2 - 2x - 5$ in the domain $-2 \le x \le 3$, where $x \in \mathbb{R}$.

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Use the graph drawn in **(b)(i)** to estimate:

(ii) The value of $2x^2 - 2x - 5$ when $x = 0{\cdot}5$. (Show your work on the graph.)

(iii) The values of x for which $g(x) = 0$. (Show your work on the graph.)

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 2014 examination in *Mathematics* under Phase 2 of *Project Maths*. The content and structure do not necessarily reflect the 2015 or subsequent examinations.

In the 2014 examination, one question will be similar in content and style to Question 6 in previous years. On this sample paper, Question 6 from the 2013 examination has been inserted, as Question 14, to illustrate.

Junior Certificate 2014 – Ordinary Level

Mathematics (Project Maths – Phase 2) – Paper 1

Sample Paper
Time: 2 hours