Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination 2015
Sample Paper

Mathematics

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		15	
6			
7			
8			
9			
10		Total	

Grade

Instructions

There are 15 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.

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.

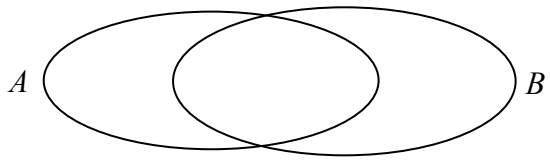
You may lose marks if the appropriate units of measurement are not included, where relevant.

You may lose marks if your answers are not given in simplest form, where relevant.

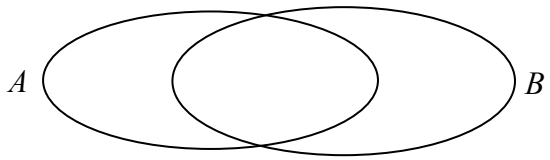
Write the make and model of your calculator(s) here:

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

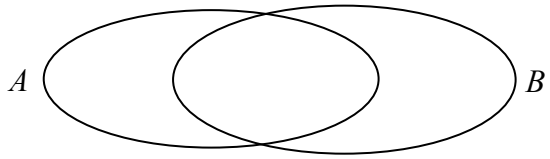
(a) On the Venn diagram below, shade the region that represents $A \cup B$.



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



(c) Using your answers to **(a)** and **(b)** above, or otherwise, shade in the region $(A \cup B) \setminus (A \setminus B)$ on the Venn diagram below.

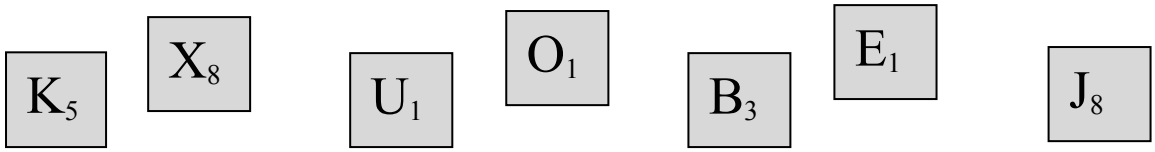


(d) If A represents the students in a class who like fruit and B represents the students in the same class who like vegetables, write down what the set $A \setminus B$ represents.

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

In the game of *Scrabble*, players score points by making 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

(a) 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. Part of one line of the board is shown below. Maura places her word on this line with one letter in each adjacent box.

(b) Maura places her word on the board below in a way that gives the maximum possible score. Write in her word to show how she does this.

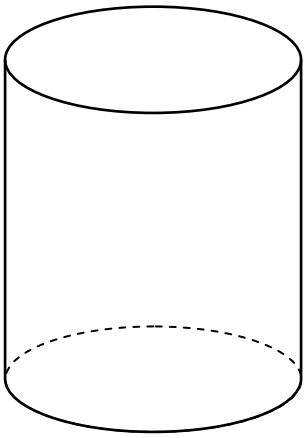
			Double letter score						Double letter score

(c) 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)**

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

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



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

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

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

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

	R	S	T	U
A				
B				
C				
D				
E				
F				
G				

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

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

___ × ___ = ___

(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 €5000 and would like to invest it for two years. A special savings account is offering an annual compound interest rate of 4% if the money remains in the account for the two years.

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

(b) Tax of 41% will be deducted each year from the **interest** earned.
Find the tax on the interest from part **(a)**.

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

€5000 + Interest – Tax =

(d) Find the total amount of Dermot's investment at the end of the second year, after the tax has been deducted from the interest.

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

Samantha is estimating the number of people at a concert.
There are people sitting and people standing at the concert.

(a) Samantha counts 52 rows of seats. She estimates that there are 19 people sitting in each row.

By rounding each number to the nearest 10, estimate the total number of people sitting at the concert.

Estimated total number of people sitting = ☐ × ☐ = ☐

(b) Samantha estimates that the standing space is 600 m^2.
She estimates that, on average, there are 2 people standing in each square metre.

Use this to estimate the total number of people who are standing at the concert.

(c) A standing ticket for the concert cost €10 and a sitting ticket cost €15. Use your answers from parts **(a)** and **(b)** to estimate the total amount of money paid for tickets for the concert.

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

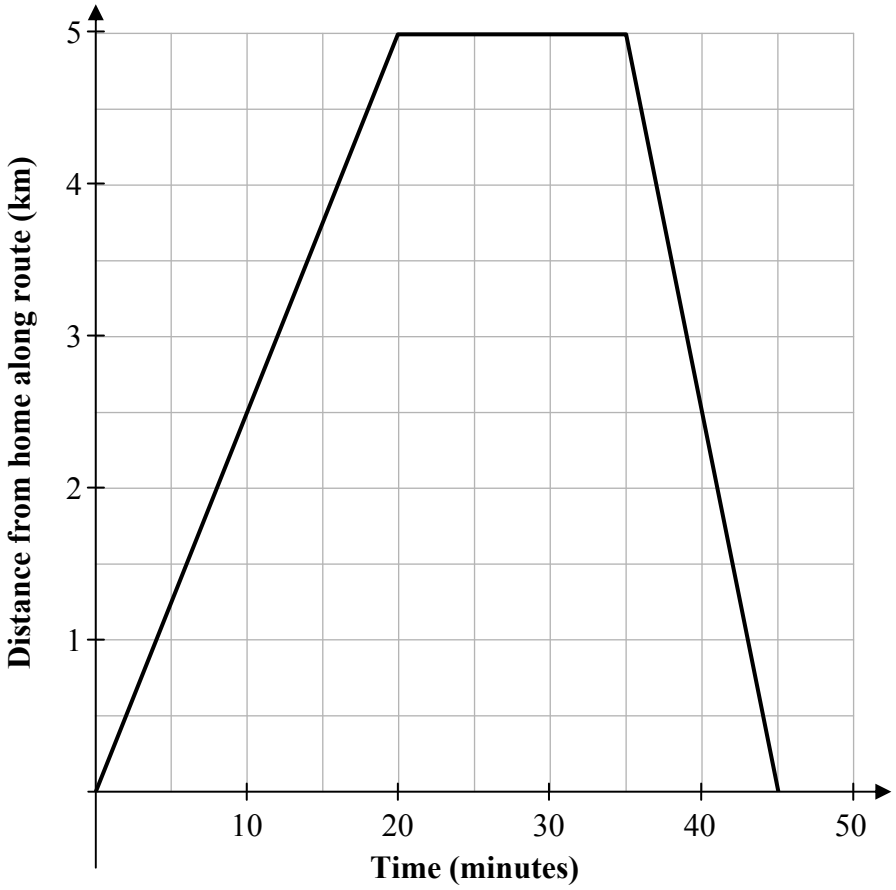
(a) Write $2 \times 2 \times 2 \times 2 \times 2 \times 2$ in the form 2^x, where $x \in \mathbb{N}$. Answer = 2 ☐

(b) If $2^p \times 2^3 = 2^8$, write down the value of p. $p =$ ☐

(c) Write $\frac{2^5 \times 2^6}{2^4 \times 2^3}$ in the form 2^x, where $x \in \mathbb{N}$.

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

Olive cycled from her home to the shop. She cycled along a particular route, and returned by the same route. The graph below shows her distance from home along the route travelled, from the time she left until she returned.



(a) What is the distance from Olive's home to the shop?

(b) How long did Olive stay in the shop?

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

(d) Write a paragraph to describe her journey.

Question 9 **(Suggested maximum time: 15 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.

(a) 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		

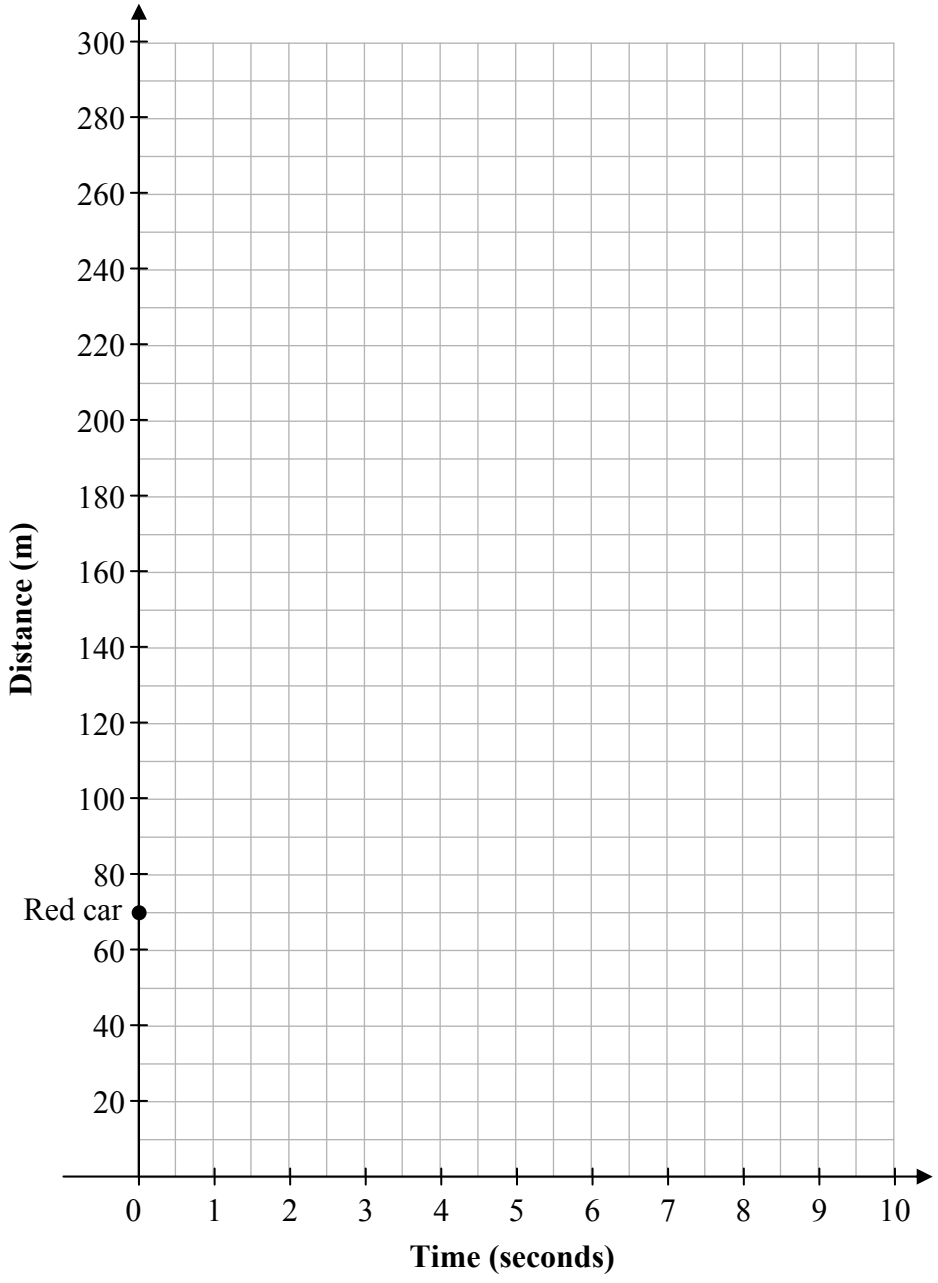
(b) After how many seconds will both cars be the same distance from Tina?

(c) Write down a formula to represent the distance between the red car and Tina for any given time. State clearly the meaning of any letters you use in your formula.

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

(e) Explain how you could use your formulas from **(c)** and **(d)** to verify the answer that you gave to part **(b)** above.

(f) On the diagram below, draw graphs of the distance between the red car and Tina, and the distance between the blue car and Tina, over the 9 seconds.



(g) Explain the connection between your answer to **(b)** and the graphs in **(f)** above.

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

Mark works two jobs – he works in Bob's Bakery and in Ciara's Café.
He is paid €11 an hour for his work in Bob's Bakery, and €9 an hour for his work in Ciara's Café.
In one week he worked a total of 16 hours and was paid a total of €152.

Find how many hours he worked in Bob's Bakery in this week.

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

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

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

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

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Question 12 **(Suggested maximum time: 15 minutes)**

The expressions $3x + 5$, $x + 1$, and $2x - 10$ are examples of **linear** expressions in x.

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

(a) Write down a linear expression in x, other than $x + 2$, that has $x + 2$ as a factor.

(b) To get her quadratic expression, Denise multiplies $x + 2$ by $2x + 3$. Find Denise's expression. Give your answer in the form $ax^2 + bx + c$, where $a, b, c \in \mathbb{Z}$.

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

(c) 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?

(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 $x + 2$.

(e) Write down one quadratic expression, other than those already given above, that has $x + 2$ as a factor. Give your answer in the form $ax^2 + bx + c$, where $a, b, c \in \mathbb{Z}$.

Question 13 **(Suggested maximum time: 5 minutes)**

(a) Solve the equation $x^2 + 7x + 12 = 0$.

(b) Verify **one** of your answers from **(a)**.

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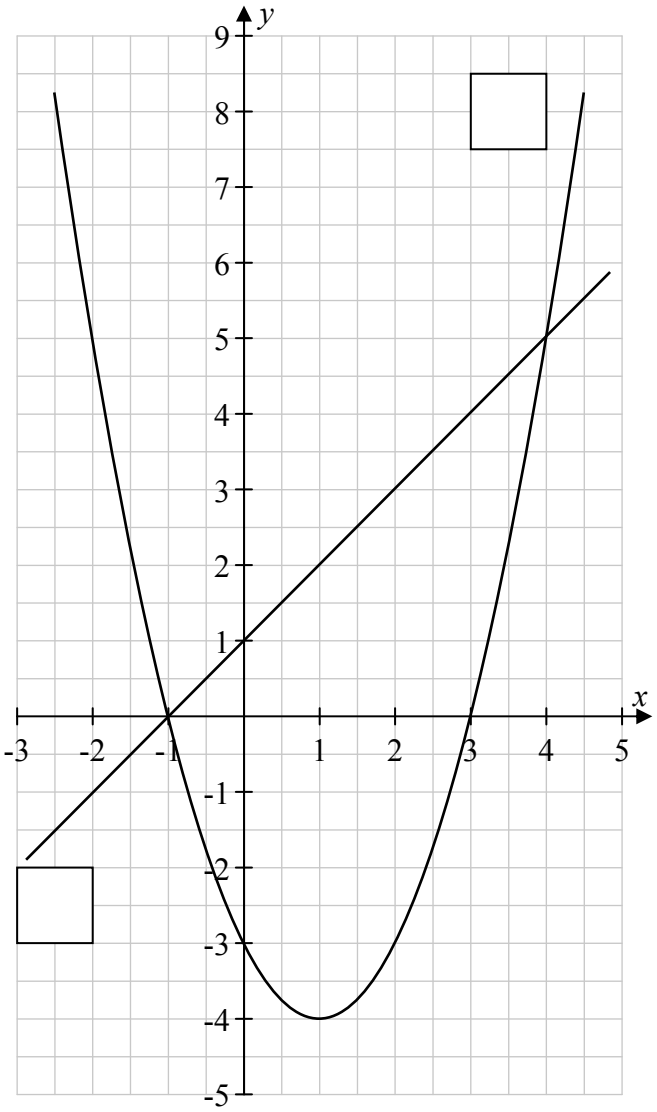
Question 14 **(Suggested maximum time: 10 minutes)**

The graphs of two functions, f and g, are shown on the grid below. The functions are:

$$f(x) = x^2 - 2x - 3$$
$$g(x) = x + 1$$

(a) Match the graphs to the functions by writing $f(x)$ or $g(x)$ in the boxes beside the corresponding graphs on the grid.



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

Function:

Explanation:

(c) Use the graph to find $f(2)$.

$f(2) =$ ☐

(d) Verify your answer to **(c)** above by finishing the following calculation.

$$f(2) = (2)^2 - 2(2) - 3$$
$$=$$

(e) Use the graph to find the value of x for which $g(x) = 3$.

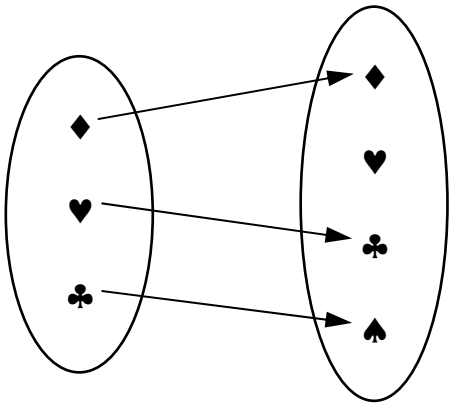
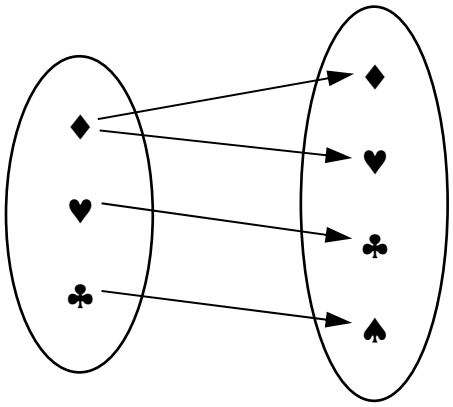
$x =$ ☐

(f) Use the graphs to find the values of x for which $x^2 - 2x - 3 = x + 1$.

$x =$ ☐ and $x =$ ☐

Question 15 **(Suggested maximum time: 5 minutes)**

Two diagrams, labelled **A** and **B**, are shown below.
One diagram represents a function; the other does not.

Diagram A	**Diagram B**
	

State which diagram does **not** represent a function. Justify your answer.

Answer:

Explanation:

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 candidates and teachers prepare for the June 2015 and subsequent Junior Certificate examinations in *Mathematics*.

The number of questions on the examination paper may vary somewhat from year to year.

Junior Certificate 2015 – Ordinary Level

Mathematics – Paper 1

Sample Paper
Time: 2 hours