Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination 2015

Mathematics

Paper 1
Ordinary Level

Friday 5 June – Afternoon 2:00 to 4:00

300 marks

Examination number

Centre Stamp

Running total	

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

Grade

Instructions

There are 12 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. You may 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: 10 minutes)**

(a) Find the value of each of the following.

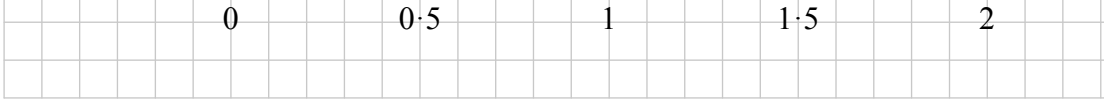
(i) $2 \cdot 5 - 1 \cdot 5 \times 0 \cdot 1$

(ii) $\sqrt{5 + 1 \cdot 25}$

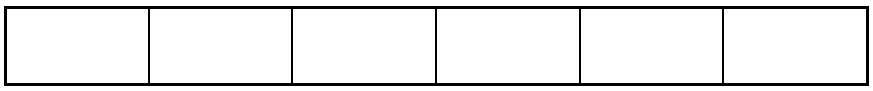
(iii) $(-2)^3$

(b) **Show** each of the following numbers on the number line below. **Label** each one clearly.

$$0 \cdot 1, \quad {}^1/_2, \quad 1 \cdot 7$$



(c) **(i)** **Shade in** $^1/_3$ of the following strip.

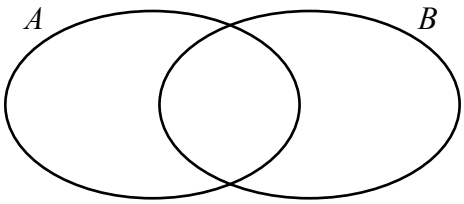


(ii) Fill in the two blanks below, to show two fractions that have the same value as $^1/_3$.

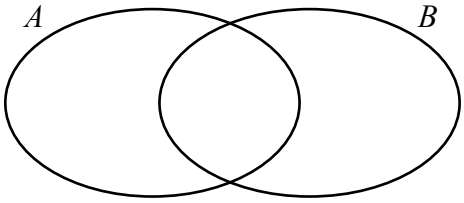
$$\frac{1}{3} = \frac{\quad}{6} = \frac{4}{\quad}$$

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

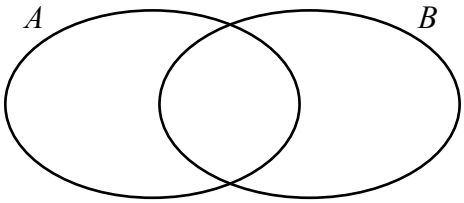
(a) On the Venn diagram below, **shade in** the region that represents $A \cap B$.



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



(c) On the Venn diagram below, **shade in** the region that represents $(A \cup B) \setminus (A \cap B)$.



(d) Put a tick (✓) in the correct box to show which of the following represents the elements that are **in *A* but not in *B***.

$B \setminus A$	$A + B$	$A \setminus B$
❐	❐	❐

Question 3 **(Suggested maximum time: 10 minutes)**

Daniel wants to buy a bike. The usual price of the bike is €320.
The bike is on "special offer" in three different shops.

(a) **Shop A** offers **10% off** the usual price of the bike.
Fill in the table to show the "special offer" price of the bike in this shop.

Usual Price:	€320
"Special offer" price:	

(b) **Shop B** offers $^{1}/_{4}$ **off** the usual price of the bike.
Fill in the table to show the "special offer" price of the bike in this shop.

Usual Price:	€320
"Special offer" price:	

(c) In **Shop C**, Daniel can pay **€60 now, plus €20 at the end of each month for 12 months**.
Fill in the table to show the "special offer" price of the bike in this shop.

Usual Price:	€320
"Special offer" price:	

(d) Do you think Daniel should buy the bike in shop **A**, **B**, or **C**?
Give a reason for your answer.

Answer:

Reason:

page	running

Question 4 **(Suggested maximum time: 10 minutes)**

For her birthday, Rachael went to Belfast with her family.
They left Dublin at 2:50 p.m. and arrived in Belfast 2 hours and 20 minutes later.

(a) At what time did they arrive in Belfast?

The hotel room cost £140 sterling. The exchange rate was £1 sterling = €1·28.

(b) Find the cost of the hotel room, in euro (€).

The family went to a concert in Belfast.
An adult's ticket cost €80. A child's ticket cost €60.

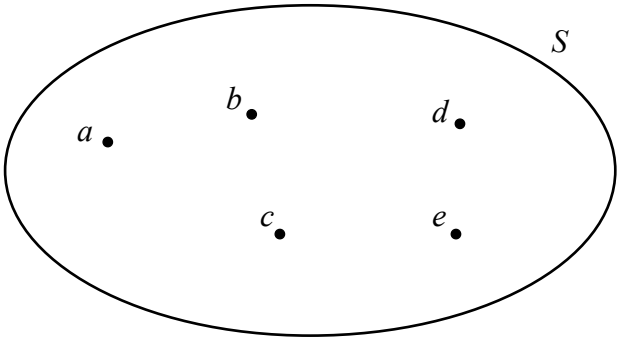
(c) Write the cost of a child's ticket as a percentage of the cost of an adult's ticket.

There were 4000 people at the concert.
The ratio of children to adults at the concert was 3:5.

(d) Find the number of children at the concert.

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

The set S is shown in the Venn diagram below. It has 5 elements.



Some students are asked to write down **subsets** of S that have **3 elements** each.
Eoin writes down the subset $\{a, c, d\}$.

(a) Write down **two more subsets** of S that have 3 elements each.

Subset 1 = { , , }

Subset 2 = { , , }

Cliodhna writes down $\{a, b, w\}$.

(b) Explain why this is **not** a subset of S.

Question 6 **(Suggested maximum time: 10 minutes)**

A juice bar makes smoothies in two sizes, small and large.
Their menu is shown below.

Smoothie	Small	Large
Strawberry Slurp	€2·00	€4·00
Banana Boost	€1·50	€3·00
Apple Swirl	€1·80	€3·60
Lemon Crush	€2·10	€4·20

Gary buys a **small** Lemon Crush and a **large** Apple Swirl.

(a) Find the total cost of these two smoothies.

Elaine wants to buy two small smoothies and one large smoothie. She has €7 to spend.

(b) **Complete** the sentence to show one combination of smoothies that Elaine could buy.
Find the total cost of these three smoothies.

Elaine could buy a small [Strawberry Slurp], a small [ ], and a large [ ].

Total cost of these three smoothies:

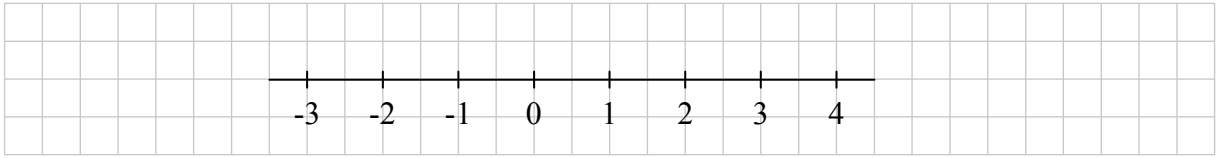
The juice bar makes another smoothie, an Orange Twist.
A **small** Orange Twist costs €1·60.

(c) Use the prices in the menu above to work out how much a **large** Orange Twist costs.
There is a relationship between the prices of the small and large smoothies in the menu.

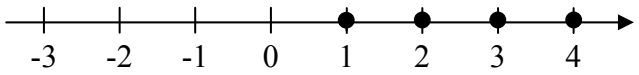
Question 7 **(Suggested maximum time: 5 minutes)**

(a) Graph the following inequality on the number line below.

$x \leq 2, \quad x \in \mathbb{R}$



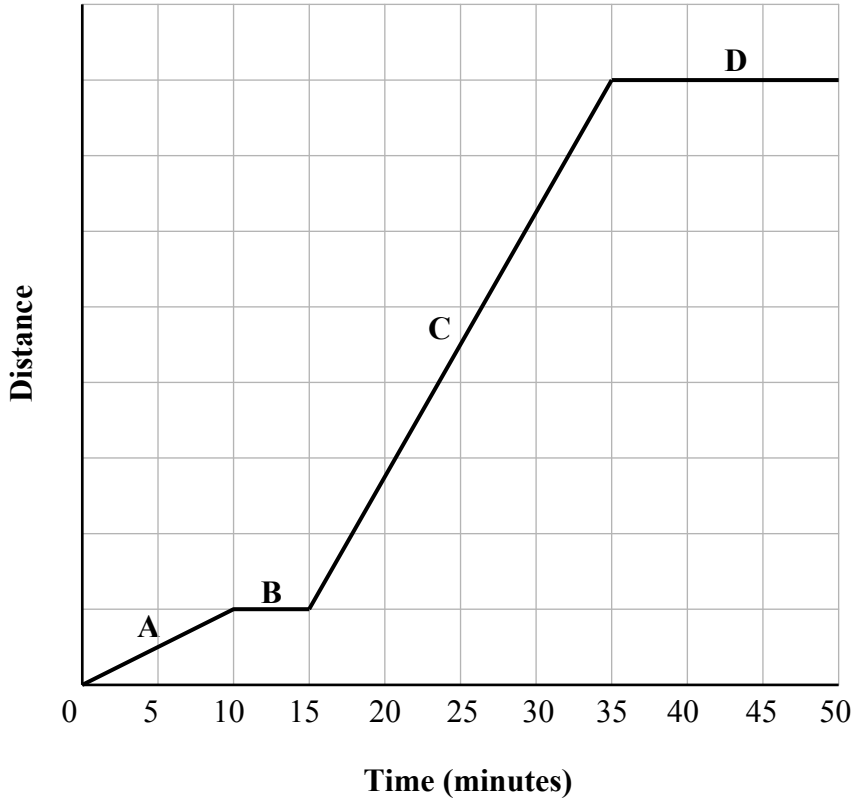
(b) Put a tick (✓) in the correct box in the table to show which inequality is graphed on the number line below.



Inequality	Put a tick (✓) in **one** box only
$x \leq 1, \quad x \in \mathbb{N}$	
$x \geq 1, \quad x \in \mathbb{N}$	
$x > 1, \quad x \in \mathbb{N}$	
$x < 1, \quad x \in \mathbb{N}$	

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

Gráinne is taking part in a training session.
The graph shows the distance she travelled during the session.
The four parts of the graph are labelled **A**, **B**, **C**, and **D**.



(a) Write the letters **A**, **B**, **C**, and **D** into the table to match each description with the correct part of the graph.

Description	Part of the Graph
Gráinne runs for 20 minutes	
Gráinne stops for 15 minutes	
Gráinne walks for 10 minutes	
Gráinne stops for 5 minutes	

(b) Gráinne runs 4 km in 20 minutes at a steady pace.
Find her speed in km per hour.

Question 9 **(Suggested maximum time: 5 minutes)**

Factorise fully each of the following.

(a) $7x - 21y$

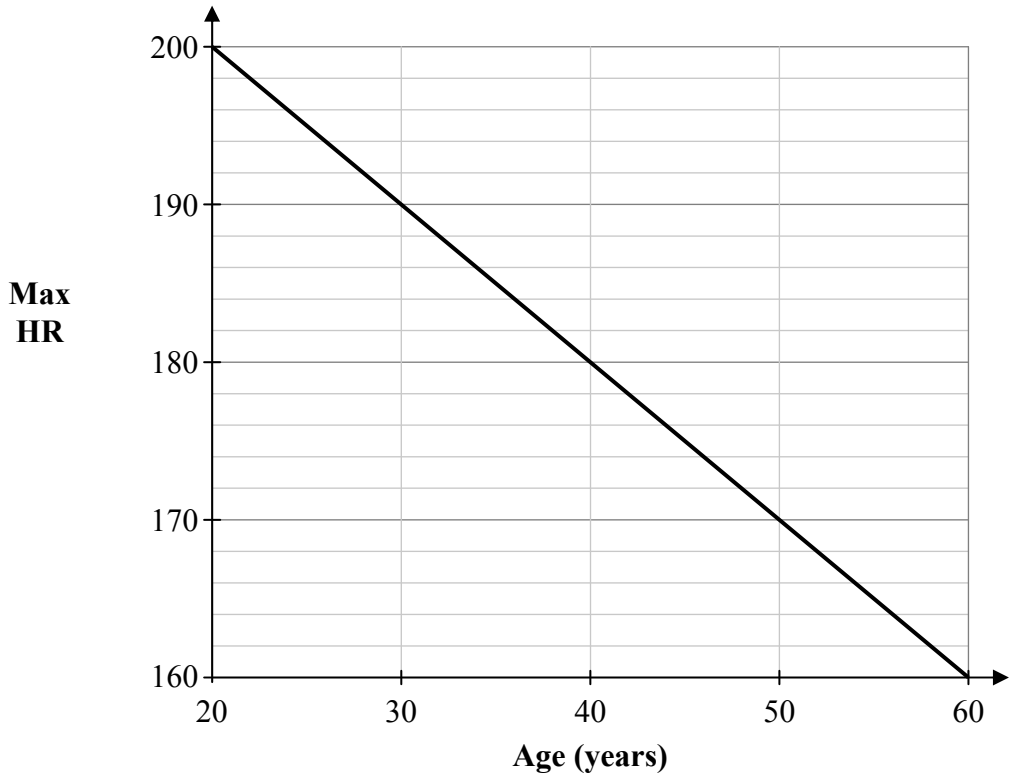
(b) $x^2 - 25$

(c) $x^2 - x - 6$

Question 10 **(Suggested maximum time: 15 minutes)**

A gym has three different formulas to estimate your maximum heart rate (Max HR), given your age in years. Different formulas can give different estimates.

The **first formula** is shown in the graph below.



(a) Use the graph above to find the Max HR for someone aged 30 years and someone aged 50 years. Show your work on the graph.

Max HR for 30 years = ☐

Max HR for 50 years = ☐

(b) Part of the formula that gives this graph is shown below.
Fill in the missing number in the formula.

Max HR = ☐ minus your Age.

The **second formula** for finding Max HR is:

Max HR = 210 minus Half your Age.

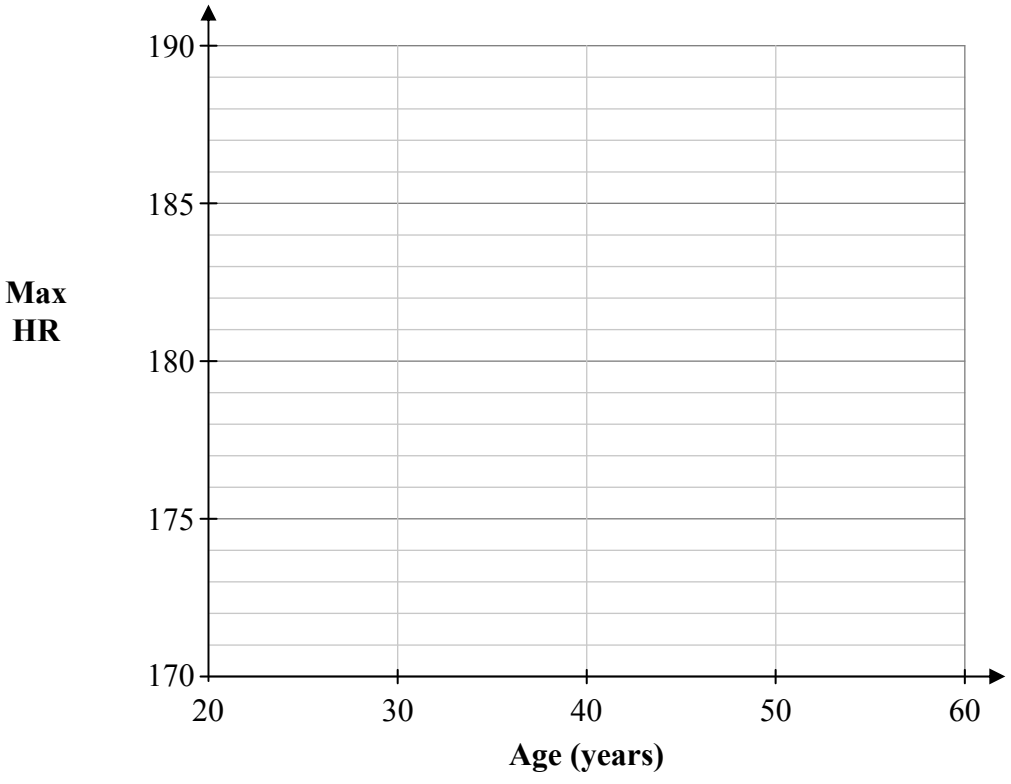
(c) Use this formula to find the Max HR for someone aged 60 years.

The **third formula** is shown in the table on the right.
The pattern in the Max HR column is a **linear** pattern.

Age (years)	Max HR
20	190
30	186
40	
50	
60	

(d) Complete the table.

(e) Using the values in the table, draw a graph on the grid below to show the Max HR for all ages from 20 years to 60 years.



Question 11 **(Suggested maximum time: 10 minutes)**

(a) Solve the equation $5x - 10 = 3x + 2$.

(b) John says that $x = 4$ is a solution of $x^2 - 2x - 8 = 0$. **Show** that John is correct.

(c) Solve the simultaneous equations:

$$x + y = 11$$
$$x - y = -5.$$

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

Martin creates a pattern of numbers using the instructions in the table below.
The first number is filled in.

(a) **Complete** the table.

Instruction	First Number	Second Number	Third Number
Starting Number	5	6	7
Multiply by 3	5×3		
Subtract 5 from your answer	$15 - 5$		
Outcome	10		

(b) Martin picks a starting number and, using the instructions, gets an outcome of 1.
Find the **starting number** he picked.

(c) When the starting number is k, what is the **outcome**? Give your answer in terms of k.

Junior Certificate 2015 – Ordinary Level

Mathematics – Paper 1

Friday 5 June
Afternoon 2:00 to 4:00