2018.S32

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination 2018

Mathematics

Paper 1
Ordinary Level

Friday 8 June
Afternoon 2:00 to 4:00

300 marks

Examination Number

Centre Stamp

Running Total	

For Examiner					
Q.	Ex.	Adv. Ex.	Q.	Ex.	Adv. Ex.
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 may lose marks if your solutions do not include supporting work.

You may lose marks if you do not include the appropriate units of measurement, where relevant.

You may lose marks if you do not give your answers in simplest form, where relevant.

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

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

(a) Martin is saving to buy a bike.
He has €100 saved to begin with. He saves another €20 each month.

(i) Work out how much **in total** Martin will have saved after 4 months.

(ii) The bike costs €240. Work out how many months **in total** Martin must save for in order to have enough money to buy the bike.

(b) Lisa is saving to buy a laptop. It costs €320.
Each week she saves the same amount of money.
She has €50 saved to begin with.

After 18 weeks, Lisa will have exactly enough money saved to buy the laptop.
Work out how much money Lisa saves each week.

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

Jakub makes a 4-digit password, using the digits of his date of birth:

2	5	1	0	9	8

He doesn't use any digit more than once.

(a) Write down a password Jakub could make that is:

(i) an odd number

(ii) a multiple of 5.

(b) Write down the **largest** number that Jakub could use as a password.

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

(a) Fill in the boxes to make this a **linear** pattern.

	,	10	,	14	,		,		.

(b) Fill in the boxes to make this a **quadratic** pattern.

2	,	4	,	7	,		,		.

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

A sheet is folded in half a number of times.
After 1 fold, there are 2 layers.
After 2 folds, there are 4 layers.
After 3 folds, there are 8 layers, and so on.

(a) Fill in the table to show the number of layers after each of the first 6 folds.

Number of folds	1	2	3	4	5	6
Number of layers	2	4	8			

(b) Work out the least number of folds that would be needed to have **more than 500** layers.

(c) Put a tick in the correct box to show what kind of pattern is made by the number of layers.
Tick (✓) **one** box only. **Justify** your answer.

linear	quadratic	exponential
☐	☐	☐

Justification:

(d) After a certain number of folds, there are roughly 1 million layers.
Roughly how many layers will there be after 3 **more** folds?

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

The following is part of a bus timetable from Galway to Limerick.

		Time		
Galway	depart	06:40	07:20	07:50
Oranmore	depart	06:48	07:28	07:57
Gort	depart	07:36	08:16	08:45
Ennis	depart	08:05	08:45	09:14
Limerick	arrive	08:45	09:25	09:44

(a) James lives in Oranmore. He needs to be in Limerick by 09:30.

(i) What is the **latest** time that James can get the bus from **Oranmore**?

Answer =

(ii) How long does his bus journey take, from **Oranmore** to **Limerick**?

(b) It takes Gina 1 hour and 15 minutes to drive from Oranmore to Limerick.

(i) What fraction of an hour is 15 minutes?

Answer: $\frac{1}{15}$ $\frac{1}{12}$ $\frac{1}{5}$ $\frac{1}{4}$

(tick (✓) **one** box only) ☐ ☐ ☐ ☐

(ii) The distance from Oranmore to Limerick is 90 km.
Work out Gina's **average speed** for the journey, in km/hour.

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

(a) Oisín earns €30 000 per year. He pays tax at 20%.

(i) Work out Oisín's **gross tax** per year.

(ii) Oisín's tax credits are €3300 per year.
Work out his **net pay** per year.

(b) Aoife's weekly pay was €800.
She got a pay rise of 5%.

Work out Aoife's weekly pay after the pay rise.

Question 7 **(Suggested maximum time: 10 minutes)**

Amina wants to buy a pair of runners.

(a) She can buy them online for £51·24. The currency conversion rate is €**1** = £**0·90**.

Convert £51·24 to euro. Give your answer correct to the nearest cent.

(b) The same runners are for sale in a local sports shop for €65.
Amina has a voucher for 15% off anything she buys in this shop.

Work out how much the runners will cost Amina if she uses this voucher.

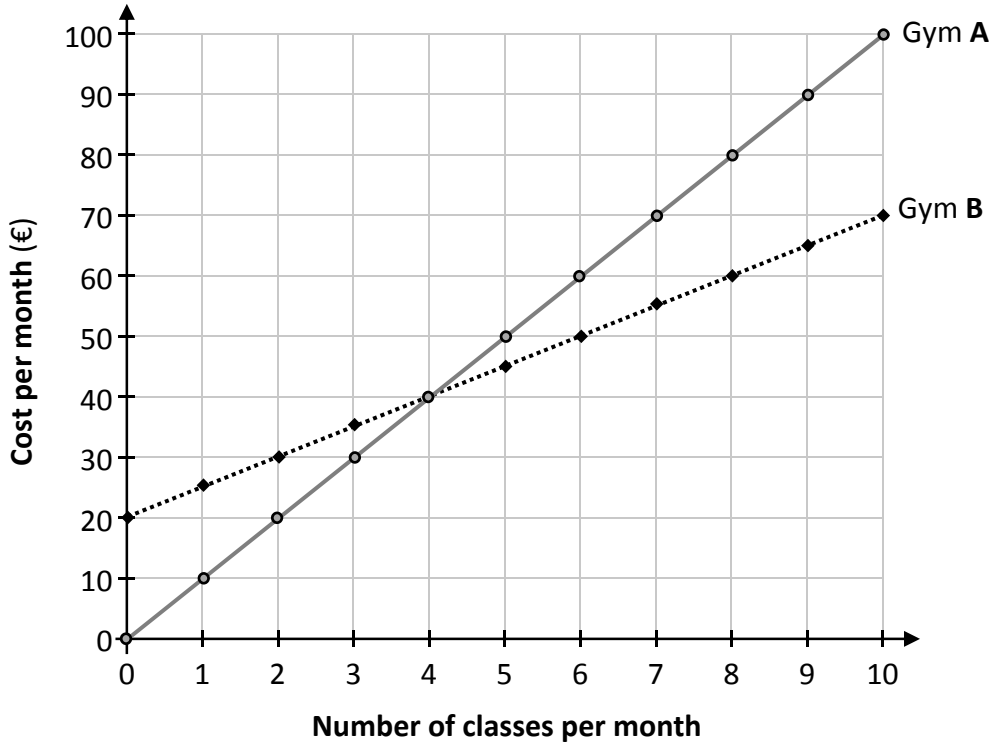
The local sports shop buys t-shirts for €20 each and sells them for €28 each.

(c) **(i)** Work out the **profit** on each t-shirt, in euro.

(ii) Work out the **percentage profit** on each t-shirt (as a percentage of the cost price).

Question 8 **(Suggested maximum time: 5 minutes)**

Emma is going to some exercise classes in a gym. The graphs below show the cost per month for 2 different gyms, Gym **A** and Gym **B**, for up to 10 classes.



(a) Based on the graphs, complete the following sentences correctly.

(i) If Emma goes to **6 classes** per month in Gym **B**, it will cost € ☐ .

(ii) Gym **A** and Gym **B** cost **the same** for ☐ classes per month.

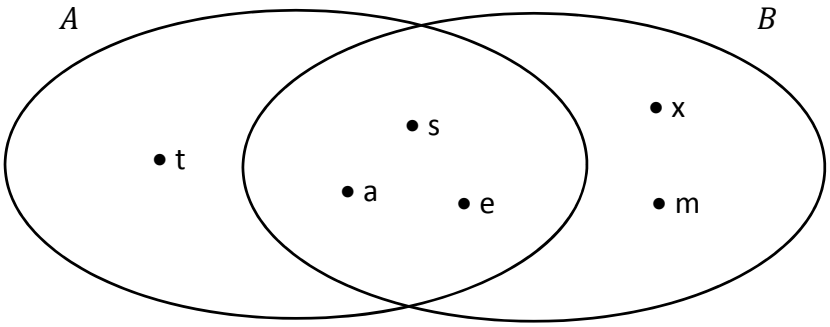
(iii) If Emma goes to **10 classes** per month, then Gym ☐ will be cheaper.

(b) Fill in the two missing values to complete the following statement correctly:

"Gym **B** costs € ☐ per month, plus € ☐ for each class."

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

(a) The Venn diagram below shows the sets A and B.



List the elements of each of the following sets.

(i) $A =$ { }

(ii) $A \cap B =$ { }

(iii) $B \backslash A =$ { }

(b) Tom says: "$P \cap Q$ is a **subset** of P, for any two sets P and Q."

State whether Tom's statement is always true, sometimes true, or never true.
Tick (✓) **one** box only. **Justify** your answer.

always true ☐ sometimes true ☐ never true ☐

Justification:

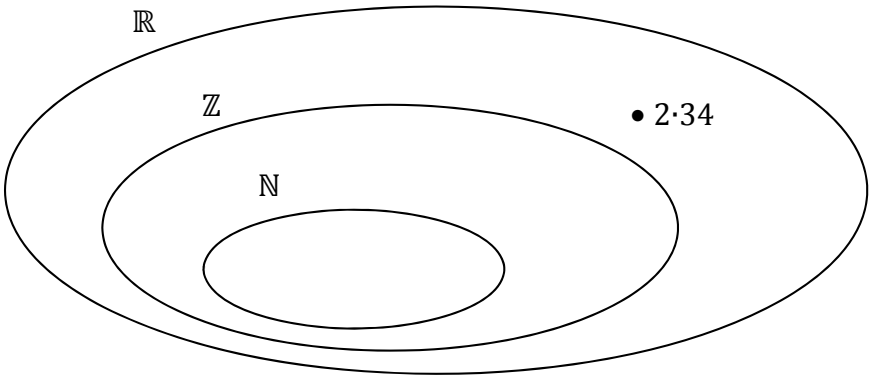
Question 10 **(Suggested maximum time: 5 minutes)**

(a) Write the following four numbers in order, from the smallest to the biggest.

$$2{\cdot}34, \qquad -3, \qquad \sqrt{5}, \qquad 2$$

Answer = ☐ , ☐ , ☐ , ☐ .

(b) Write each of these four numbers into the correct region in the Venn diagram below, where $\mathbb{R}$ is the set of real numbers, $\mathbb{Z}$ is the set of integers, and $\mathbb{N}$ is the set of natural numbers. One has been done already.



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

Eoin is E years old.

(a) Complete the table below by writing the age of each of the other people in terms of E.

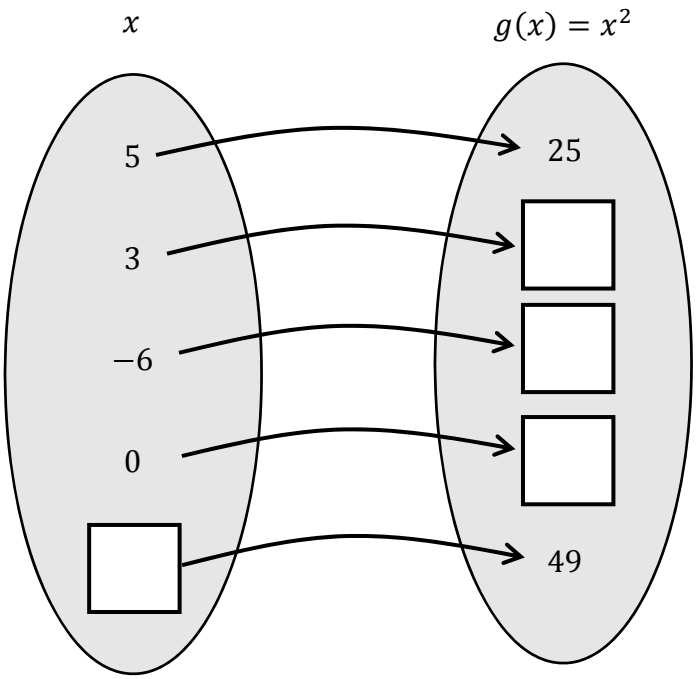
Person	Description of their age	Age, in years (in terms of E)
Eoin	Eoin's age	E
Grace	7 years younger than Eoin	
Evan	Twice as old as Eoin	
Aoibhe	3 years older than Eoin	

(b) Grace is **half** Eoin's age.
Work out Eoin's age.

Question 12 **(Suggested maximum time: 5 minutes)**

A mapping diagram of the function $g: x \mapsto x^2$ is shown below.

(a) Fill in the 4 missing entries in the diagram.



(b) Write down the **range** of the function $g(x)$, as shown in the diagram.

Range $=$ $\{\quad , \quad , \quad , \quad , \quad \}$

(c) $g(3^7) = 3^7 \times 3^7$. Write $3^7 \times 3^7$ in the form 3^n, where $n \in \mathbb{N}$.

$$3^7 \times 3^7 = 3^{\square}$$

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

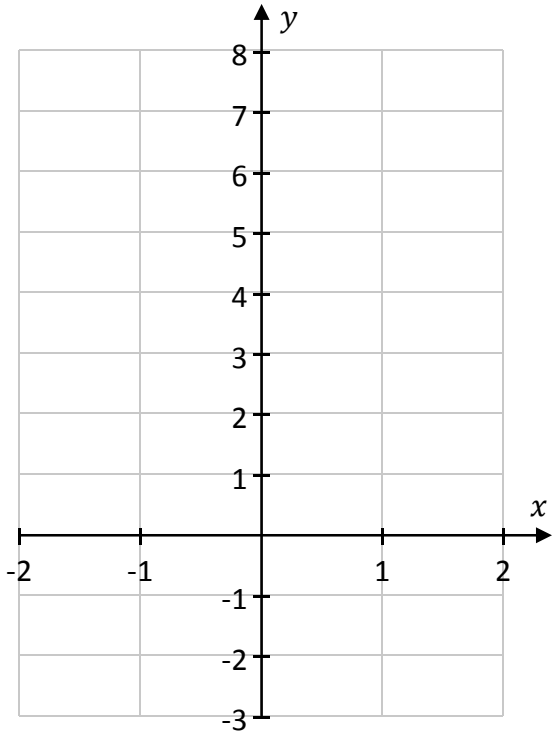
(a) Find the value of $4p - 3m$, when $p = 5$ and $m = 2$.

(b) Solve the equation $3(x + 5) + 2(2x + 3) = 0$.

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

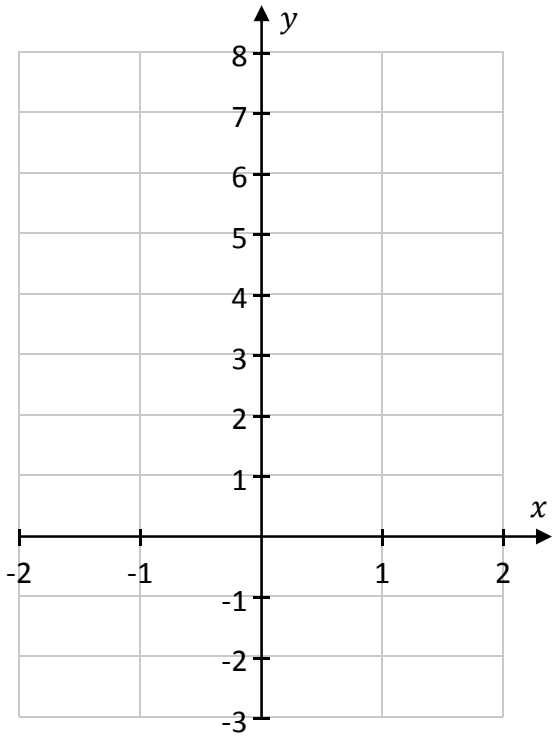
(a) **Draw** the graph of the following function in the domain $-2 \leq x \leq 2$, for $x \in \mathbb{R}$.

$$y = 2x + 3$$



(b) **Draw** the graph of the following function in the domain $-2 \leq x \leq 2$, for $x \in \mathbb{R}$.

$$y = x^2 - 1$$



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

(a) Factorise $3x + 6y$.

(b) Multiply out and simplify $(2x + 7)(x - 4)$.

(c) Harry knows that

$$(x-2)(x+8) = x^2 + 6x - 16 \, .$$

Hence, or otherwise:

(i) solve the equation $x^2 + 6x - 16 = 0$

(ii) simplify $(x^2 + 6x - 16) \div (x-2)$.

Page for extra work.
Label any extra work clearly with the question number and part.

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