Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2013

# Mathematics
# (Project Maths – Phase 2)

## Paper 1

## Foundation Level

## Friday 7 June  Afternoon 2:00 – 4:30

300 marks

| Examination number |
|---|
| |

| Centre stamp |
|---|
| |

| Running total | |
|---|---|

| For examiner | |
|---|---|
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| | |
| Total | |

| Grade |
|---|
| |

## Instructions

There are **three** sections in this examination paper.

| | | | |
|---|---|---|---|
| Section A | Concepts and Skills | 175 marks | 7 questions |
| Section B | Contexts and Applications | 75 marks | 2 questions |
| Section C | Functions and Graphs (old syllabus) | 50 marks | 1 question |

Answer all ten questions.

Write your answers in the spaces provided in this booklet. You may lose marks if you do not do so. 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.

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 — 175 marks

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

### Question 1 (25 marks)

Use your calculator to answer the following.

**(a)** Find $\sqrt[3]{264 \cdot 3}$, correct to two decimal places.

**(b)** Find the exact value of $\frac{1}{(0 \cdot 5)^2} - (1 \cdot 2)^3$.

**(c)** Write down the whole number closest to the value of $\sqrt{70} \times \tan 56°$.

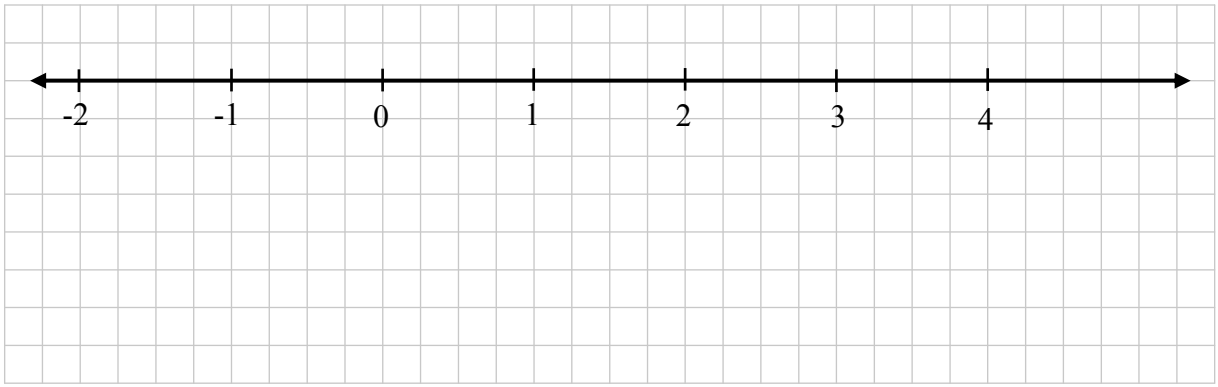
**Question 2** **(25 marks)**

**(a)** The table below shows a list of numbers and a list of sets that a number could be an element of.

**(i)** Tick **each** box opposite the number if the number belongs to that set.

| Number | Natural numbers $\mathbb{N}$ | Integers $\mathbb{Z}$ | Rational numbers $\mathbb{Q}$ | Real numbers $\mathbb{R}$ |
|---|---|---|---|---|
| 3 | | | | |
| $-2$ | | | | |
| $-0{\cdot}5$ | | | | |
| $\sqrt{2}$ | | | | |
| $2\frac{2}{3}$ | | | | |
| $\sin 30°$ | | | | |
| $\pi$ | | | | |

**(ii)** Mark each of the numbers in the table above on the number line below and label each number clearly.



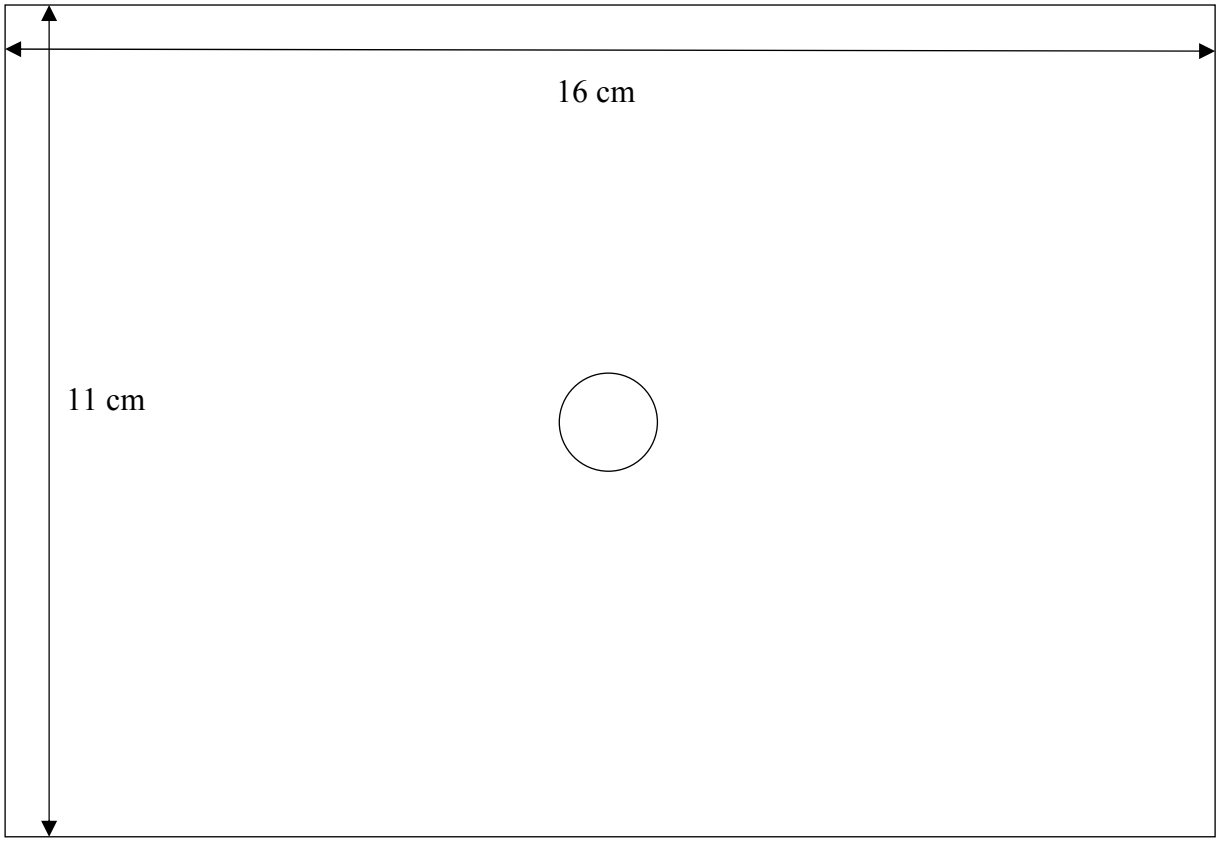

**(b)** The average distance from the earth to the moon is $3{\cdot}84\times10^5$ km.

**(i)** Write this distance as a whole number of kilometres.

**(ii)** It took Apollo astronauts 3 days and 4 hours to travel to the moon from earth. Find their average speed in km per hour.

**Question 3** **(25 marks)**

Liam wants to draw a scaled diagram of a soccer pitch using a scale of 1 cm = 6·25 m. He begins by drawing a rectangle measuring 16 cm long and 11 cm wide and adds in the centre circle.




**(a)** **(i)** Find the length of the soccer pitch.

**(ii)** Find the length of the perimeter of the soccer pitch.

**(b)** The centre circle of the soccer pitch has a radius of 9·15 m.

**(i)** Calculate the area of the centre circle on the soccer pitch.

**(ii)** Find the correct radius of the centre circle for Liam's scaled diagram.

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**Question 4** **(25 marks)**

**(a)** Mary buys a new car which costs €26 000.
The garage gives her €8400 for her old car. She also has savings of €5600.
She borrows the remainder of the cost.
How much does she borrow?

**(b)** Mary borrows the money for three years at an annual equivalent rate (AER) of 11%.
She will repay all the money and interest in one repayment at the end of the three years. How much interest will she pay?

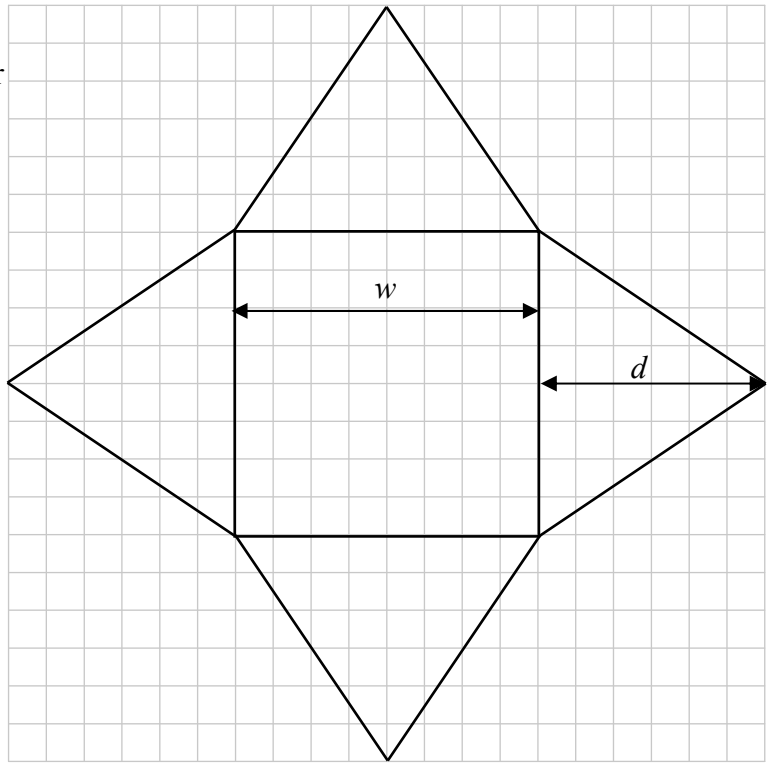
**Question 5** **(25 marks)**

The net for a figure with a square base is shown. Each grid unit is 5 mm.

**(a)** Find $w$, the length of the base, and $d$, the height of each triangular side.

$w$ = _____

$d$ = _____




**(b)** Find the area of the base of the figure.

**(c)** Find the total surface area of the figure.

**Question 6** **(25 marks)**

**(a)** Find the value of $a^2 + b^2$ when $a = 20$ and $b = 21$.

**(b)** Given that $a^2 + b^2 = c^2$, find the value of $c$.

**(c)** Solve the equation $x^2 - 3x - 10 = 0$.

**Question 7** **(25 marks)**

**(a)** Simplify $2(3x-6)-(4x-8)$.

**(b)** Solve the equation $7x-4=5x+16$.

**(c)** Write down the natural numbers which satisfy the inequality $3x-2\leq 13$.

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## Section B — Contexts and Applications — 75 marks

Answer **both** Question 8 **and** Question 9.

### Question 8 (40 marks)

Mr. and Mrs. Murphy and their three children want to fly from Dublin to Arrecife for a weeks holiday. They look up the airline timetable below.

| Outbound: Dublin to Arrecife | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Flight | Mon | Tues | Wed | Thur | Fri | Sat | Sun | Departs | Arrives |
| E107 | ✈ | | | ✈ | ✈ | ✈ | | 06:45 | 10:40 |
| E117 | | | | | | ✈ | | 13:15 | 17:25 |
| **Return: Arrecife to Dublin** | | | | | | | | | |
| E108 | ✈ | | | ✈ | ✈ | ✈ | | 11:55 | 15:55 |
| E118 | | | | | | ✈ | | 18:40 | 22:35 |

**(a)** The Murphys book the early flight outbound on Saturday and the latest return flight on the following Saturday afternoon.

**(i)** The flight number for the outbound flight is _____ .

The flight number for the return flight is _____.

**(ii)** The latest check-in time at Dublin is 1 hour 50 minutes before the flight departure time. What is the latest check-in time for their outbound flight?

**(iii)** How long does their flight from Dublin to Arrecife take?

**(iv)** Their return flight from Arrecife to Dublin was delayed by 1 hour 40 minutes. At what time did their flight arrive back in Dublin?

**(b)** The following information was used to calculate the cost of their holiday.

- The return airfare is €360 for an adult and €270 for a child.
- The cost of hotel accommodation for a week is €420 for an adult and €210 for each of the first two children. The third child is free.
- Holiday insurance costs €18·75 per person.

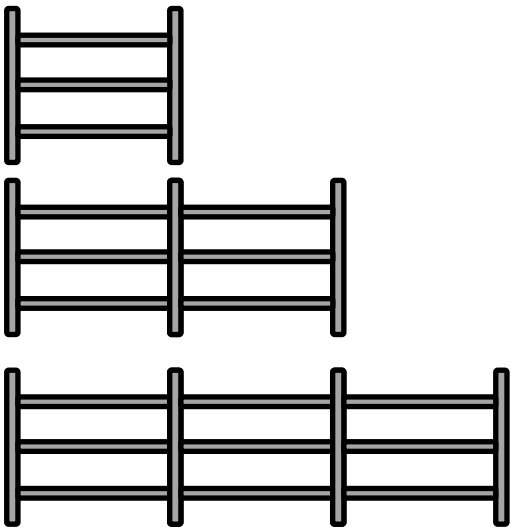
**(i)** Find the total cost of the airfares for the Murphy family.

**(ii)** Find the total cost of the holiday for the Murphy family.

**Question 9** **(35 marks)**

Jim constructs a fence by using three horizontal rails between each two vertical posts. Jim draws the diagrams below and begins a table to show the number of rails he will need depending on how many posts he uses.

| Number of posts ($x$) | Number of rails ($y$) |
|---|---|
| 2 | 3 |
| 3 | 6 |
| 4 | |
| 5 | |
| 6 | |



**(a)** Complete the table above.

Jim thinks that to find the number of rails needed he should subtract 1 from the number of posts used and multiply the answer by 3.

**(b)** Write an algebraic expression to represent Jim's rule, using $x$ to represent the number of posts and $y$ to represent the number of rails.

**(c)** Test your expression in **(b)** above using the numbers in one row of the table.

**(d)** Jim uses 60 posts for his fence. Find the number of rails he needs.

**(e)** Ann thinks that an alternative rule to find the number of rails is to multiply the number of posts by 3 and then subtract 3 from the answer. Write an algebraic expression to represent Ann's rule, using $x$ to represent the number of posts and $y$ to represent the number of rails.

**(f)** **(i)** Use Ann's rule to find how many rails are needed if 10 posts are used.

**(ii)** Use Ann's rule to find how many posts are used if 228 rails are needed.

## Section C — Functions and Graphs (old syllabus) — 50 marks

Answer Question 10 from this section.

**Question 10** **(50 marks)**

**(a)** Draw the graph of the function $f : 2x^2 - 3x - 6,$ for $-2 \le x \le 3,$ $x \in \mathbb{R}$.

**(b)** Use your graph to estimate the following:

**(i)** the value of $f(1{\cdot}5)$

Answer: _____

**(ii)** the minimum value of $f(x)$

Answer: _____

**(iii)** the values of $x$ for which $f(x) = 2$

Answer: _____

**(iv)** the range of values of $x$ for which $f(x)$ is decreasing.

Answer: _____

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