Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination, 2012

Mathematics
(Project Maths – Phase 2)

Paper 1

Ordinary Level

Friday 8 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		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.

Question 15 carries a total of 50 marks.

Write your answers in the spaces provided in this booklet. 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 booklet of *Formulae and Tables*. 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.

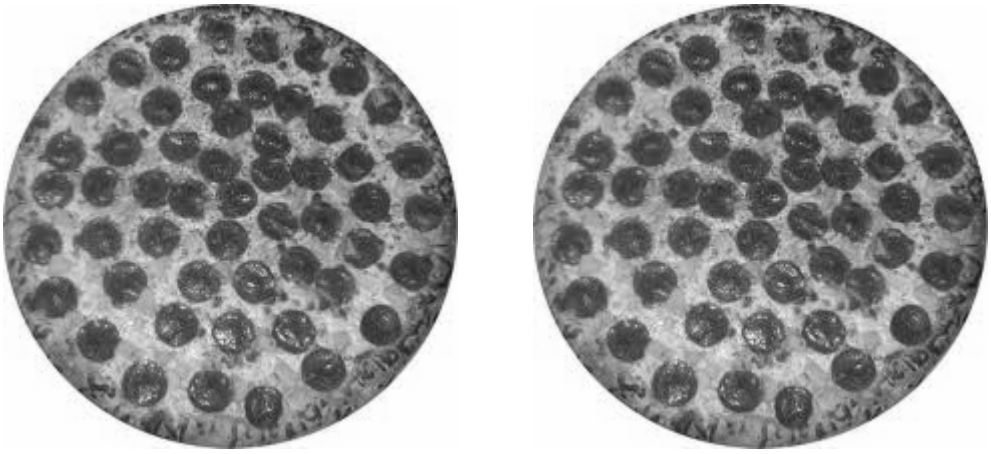
Answers should include the appropriate units of measurement, where relevant.

Answers should be given in simplest form, where relevant.

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

Question 1 **(Suggested maximum time: 2 minutes)**

Sheila orders two pizzas to divide evenly between herself and five friends.



(a) What fraction of a pizza will each person get? Write your fraction in its simplest form.

(b) One of the friends gets a text and leaves before the pizza is delivered. What fraction will each person now get if the pizzas are divided evenly between those remaining?

(c) Find how much extra pizza each person gets.

page	running

Question 2 **(Suggested maximum time: 15 minutes)**

(a) Cathy works in a bakery and earns €8·65 per hour. She works 40 hours a week. Find Cathy's gross pay for the week.

(b) Cathy has to pay income tax at a rate of 20%. Find Cathy's gross tax.

(c) She has a tax credit of €20 per week. Find Cathy's net tax.

(d) How much per week is she left with?

(e) Cathy had €1650 saved in the credit union at the beginning of a year. The credit union paid 4·5% interest on her money. Find the interest earned in that year.

(f) Cathy wants to use this interest to pay an electricity bill. Electricity costs 20 cent per unit. She used 250 units. The bill also has a standing charge of €30. Calculate the electricity bill.

(g) Does Cathy have enough money from the interest to pay the electricity bill? Explain your answer.

Answer:

Reason:

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

The table below shows the values when 2 is raised to certain powers.

(a) Complete the table.

Power of 2	**Expanded power of 2**	**Answer**
2^1	2	2
2^2	2×2	4
2^3	$2 \times 2 \times 2$	
2^4		
2^5		
2^6		
2^7		
2^8		
2^9		

Maria wins a prize in a lottery and is given two options.
Option A: €1000 cash today
or
Option B: Take €2 today, €4 tomorrow, €8 the next day, and doubling every day for 9 days.

€1000

€2 + €4 + €8 + € + . . .

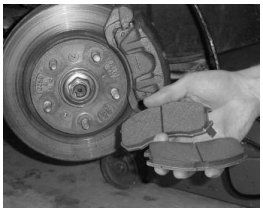
(b) Which option should Maria choose if she wants to get the most prize money? Explain your answer.

Option:

Reason:

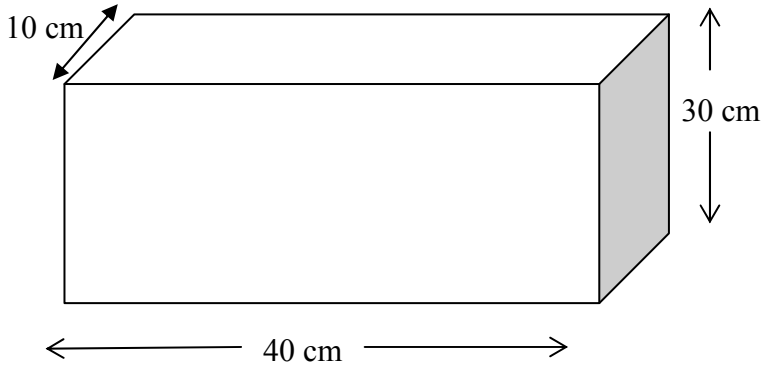
Question 4 **(Suggested maximum time: 5 minutes)**

John takes his car to a garage for a service and receives an itemised bill.
Find the total cost of servicing the car.

Itemised bill for service	Cost
5 litres of oil at €4·20 per litre	
2 windscreen wiper blades at €4·50 per blade	
 2 brake shoes at €28 each	
2 hours of labour at €60 per hour	
Sub-total (before VAT added)	
VAT @ 13·5%	
Total bill	

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

Ciaran is wrapping a present in a rectangular box.



(a) How many faces has the rectangular box? _____.

(b) Draw a net of the rectangular box here, to a suitable scale.

(c) Indicate on your diagram in **(b)** one pair of faces that are equal in area.

(d) Find the surface area of the box.

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

The universal set, $U = \{ 1, 2, 3, 4, 5, 7, 10, 11, 13, 17, 19, 20 \}$.
A is the set of prime numbers between 1 and 20. B is the set of factors of 20.

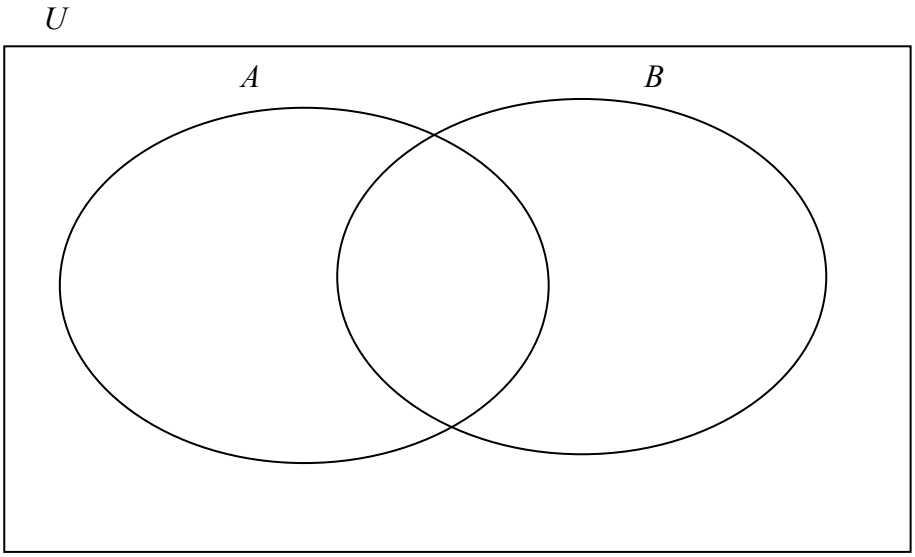
(a) List the elements of the set A.

$A = \{ \quad , \quad , \quad , \quad , \quad , \quad , \quad , \quad \}$

(b) List the elements of the set B.

$B = \{ \quad , \quad , \quad , \quad , \quad , \quad \}$

(c) Fill in the Venn diagram below placing all elements of U in the correct regions.



(d) List the elements of $A \cap B$.

$A \cap B = \{ \quad \}$

(e) Complete the sentence below.

If an element is in the region $A \cap B$, it has two properties: it is a prime number and it is _____.

(f) The number 16 is added to the universal set. Place 16 in the correct region in the Venn diagram in part **(c)** and explain why you placed it there.

Reason:

page	running

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

(a) Write the following numbers correct to the nearest ten.

121	195	504
_____	_____	_____

(b) Write the following numbers correct to 3 decimal places.

105·5555	2·173	0·0264
_____	_____	_____

(c) Write the following numbers correct to two significant figures.

2 920	159	0·0336
_____	_____	_____

(d) Karen went to a shop to buy five magazines. She had €10 to spend. She made an estimate of the total cost by correcting the price of each magazine to the next highest euro. The magazines cost €1·95, €1·99, €3·59, €1·40 and 99 cent. Work out her estimate.

(e) Based on the estimate, would she think she had enough money? _____

(f) Work out the exact cost of the magazines.

(g) Suggest what you think is a better method for estimating the total cost of the magazines. Give a reason for your answer.

Method:

Reason:

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

Kevin has saved €20. He gets €7 a week for doing jobs at home.
He spends €2 on sweets every week and saves the rest in a piggybank.

(a) How much money has he saved at the end of week 1?

(b) Complete the table to show how his savings grow in the first five weeks.

	Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**
€20		€30			

(c) Write down a formula (in words) to represent the amount he has saved at the end of each week.

(d) Kevin would like to buy a mobile phone costing €100. Use your formula to find out how many weeks he needs to save, to have enough money to buy the phone.

(e) Kevin stops buying the sweets after 5 weeks. How much can he save each week after that?

(f) Kevin thinks he can buy his phone 3 weeks sooner with the extra savings.
Do you agree with Kevin? Explain your answer.

Answer:

Reason:

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

(a) Find the values of the following expressions if $a = 4$ and $b = -1$.

(i) $2a + 3b - 2$.

$2(\quad) + 3(\quad) - 2 =$

(ii) $a^2 + b^2 + 4$

$(\quad)^2 + (\quad)^2 + 4 =$

(iii) $\dfrac{a + 2b}{2} =$

(b) Multiply $x + 4$ by $x - 6$.

$(x + 4)(x - 6) =$

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

(a) There are four terms given below. Three of them have a common factor other than 1.

$3xy$ $6ay$ $11ax$ $9y$

Underline these three terms and write down the highest common factor of the three terms.

_____.

(b) Factorise each of the following:

(i) $4x + 8y - 12z$

$= 4(\quad\quad\quad\quad\quad\quad)$

(ii) $ab - 2a + 3b - 6$

$= a(\quad\quad\quad) + 3(\quad\quad\quad)$

$= (\quad\quad\quad)(\quad\quad\quad)$

(iii) $x^2 + 5x + 6$

(iv) $b^2 - 16$

page	running

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

(a) Jane sets Molly a word problem. "If I multiply a number by seven and add four, the result is the same as multiplying the number by three and taking eight." Molly starts by writing $7x + 4 =$. Finish Molly's equation and solve it to find the number.

$7x + 4 =$

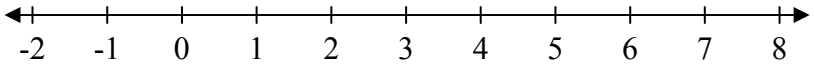
(b) Solve the equation $x^2 - 3x - 10 = 0$.

( )( ) = 0

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

(a) Solve the inequality.
$3x - 5 \geq -2, \ x \in \mathbb{N}$.

(b) Mark the solution on the number line given below.



(c) John and Gemma played a new computer game called *Benga*. John scored two bengas minus three penalties. His total score was seven points. He made the equation $2x - 3y = 7$ to represent his score. Gemma scored five bengas minus five penalties for twenty points.

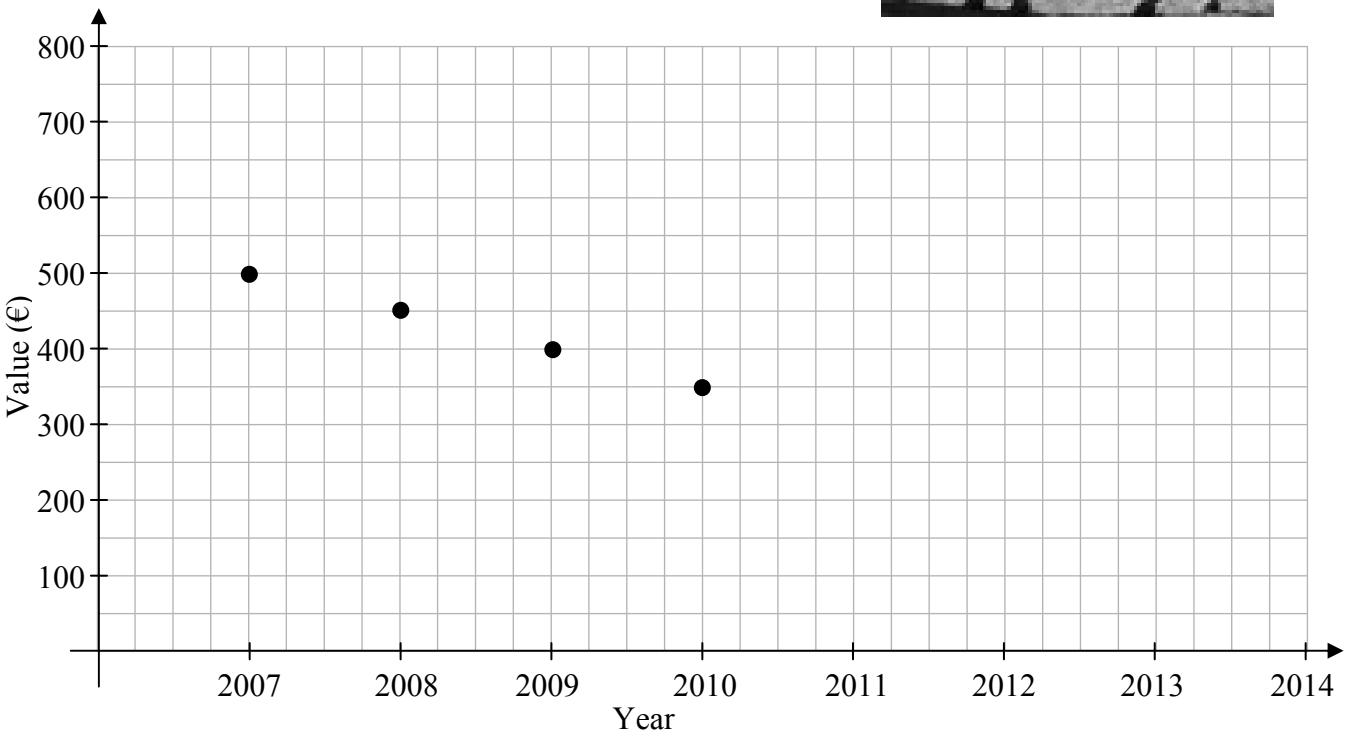
(i) Make an equation to represent Gemma's score.

(ii) Use simultaneous equations to find the number of points for a benga and the number of points for a penalty.

(iii) Verify your solutions in both equations.

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

Melissa bought a horse in 2007 for €500. She took the horse to the sales each year for three years to have it valued but did not sell. She recorded the values on the graph below.



(a) Use a line to join the points on the graph.

(b) If the pattern continued, what was the horse worth in 2011? _____

(c) How much does the horse lose in value each year?

(d) Melissa will sell the horse when it reaches a value of €200. If the pattern continues, in what year will she sell the horse? _____

(e) James bought a horse for €700 in 2007. His horse loses value at a constant rate**.** It was worth €100 in 2011. Mark these two points on the graph above, and join them with a straight line.

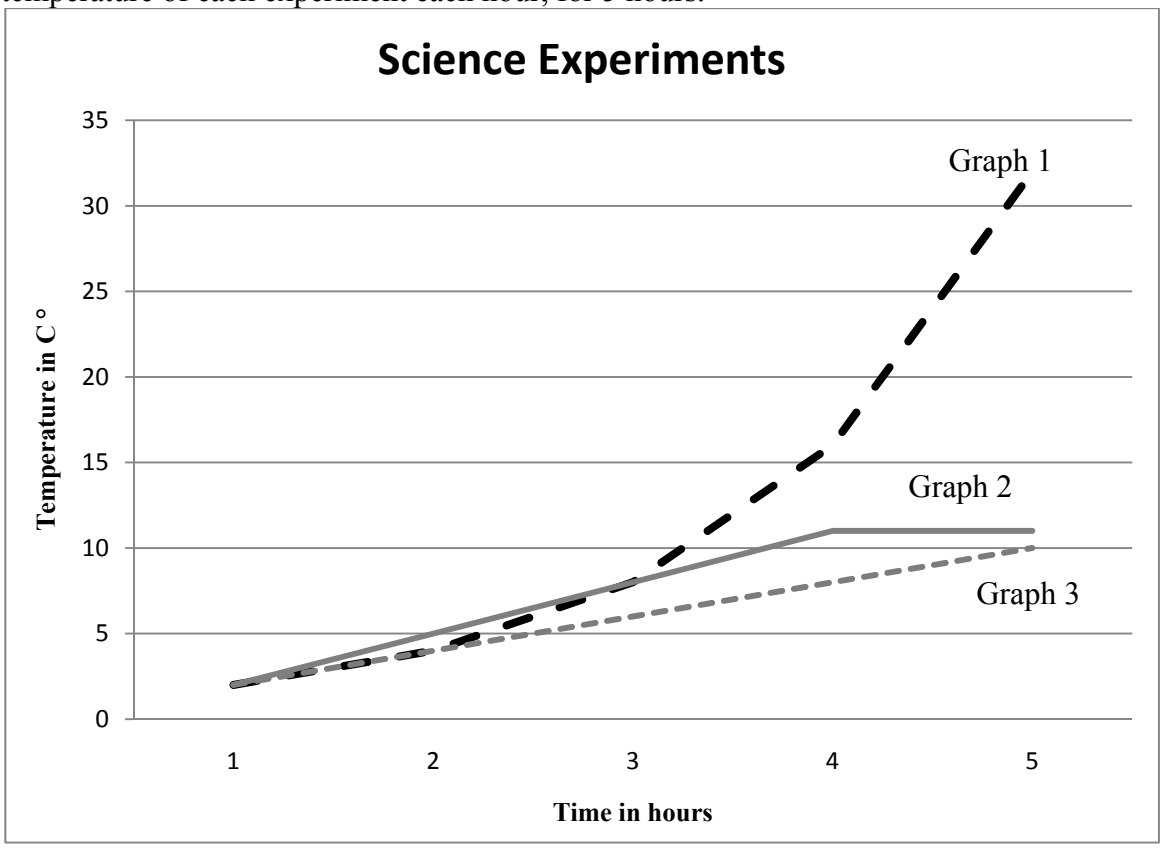
(f) In what year will the two horses have the same value? What is that value?

Year: Value:

(g) Louise examines the graph and says "looking at the slopes of the lines, I can tell which horse loses value faster". Explain in your own words what Louise means.

Question 14 **(Suggested maximum time: 2 minutes)**

Three experiments on temperature are done in the science lab. Pupils record and plot the temperature of each experiment each hour, for 5 hours.



In experiment A, the temperature doubles every hour.
In experiment B, the temperature increases by 2° every hour.
In experiment C, the temperature increases by 3° each hour for three hours and then remains constant.
Identify each experiment by its number.

Experiment	Graph number
A	
B	
C	

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

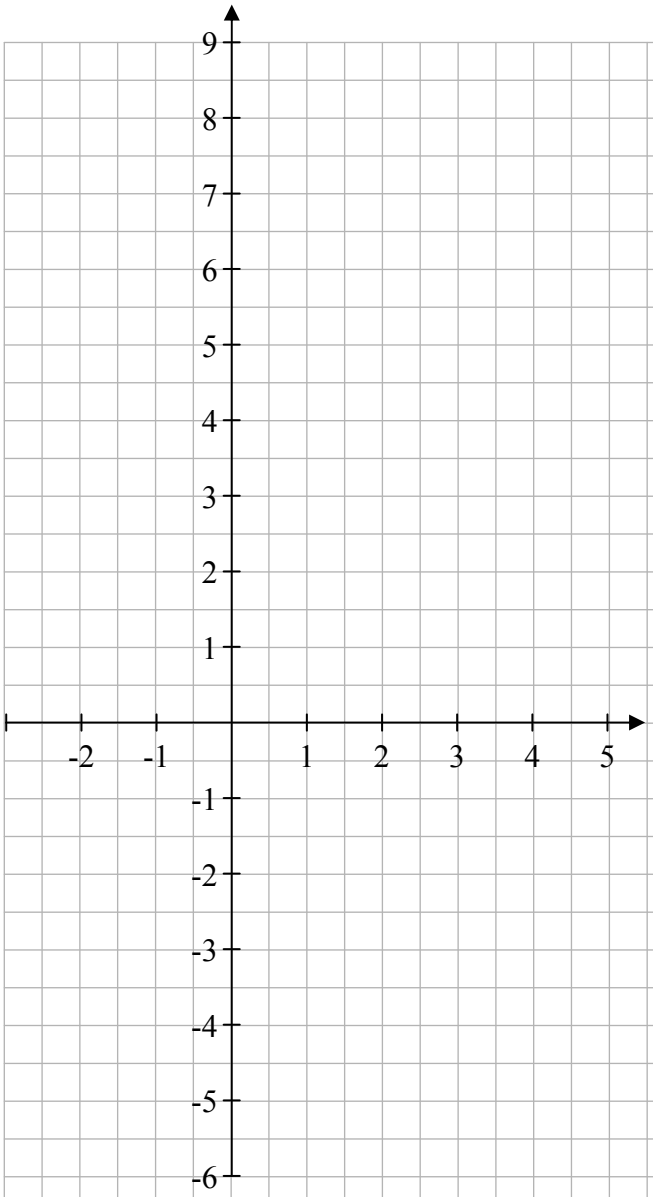
(a) $P = \{(1, a), (2, a), (3, b), (4, c)\}$.

Write out the domain and range of P.

Domain =

Range =

(b) Draw the graph of the function $f : x \mapsto 5 + 2x - x^2$ in the domain $-2 \le x \le 4$, where $x \in \mathbb{R}$.



(c) **(i)** Draw the axis of symmetry of the graph you have drawn in **15(b)**.

(ii) Use your graph to estimate the value of $5 + 2x - x^2$ when $x = 1{\cdot}5$.

Work to be shown on the graph and the answer to be written here.

You may use this page for extra work.

page	running

You may use this page for extra work.

You may use this page for extra work.

page	running

Junior Certificate 2012 – Ordinary Level

Mathematics (Project Maths – Phase 2) – Paper 1

Friday 8 June
Afternoon 2:00 to 4:00