



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination, 2013
Sample Paper

Mathematics
(Project Maths – Phase 3)

Paper 1

Higher Level

Time: 2 hours, 30 minutes

300 marks

Examination number

Centre stamp

Running total	
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For examiner			
Question	Mark	Question	Mark
1		11	
2		12	
3		13	
4			
5			
6			
7			
8			
9			
10		Total	

Grade

Instructions

There are 14 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. 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.

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:

(b) How many divisors does each of the numbers in $(A \cup B \cup C)'$ have? _____

(c) What name is given to numbers that have this many divisors? _____

Question 3

(Suggested maximum time: 10 minutes)

A group of 100 students were surveyed to find whether they drank tea (T), coffee (C) or a soft drink (D) at any time in the previous week.

24 had not drunk any of the three.

51 drank tea or coffee but not a soft drink.

41 drank tea.

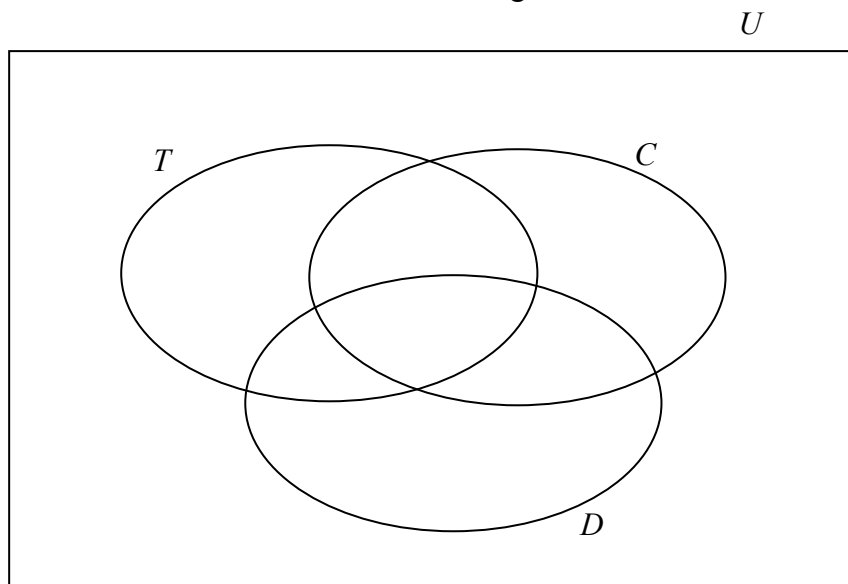
20 drank at least two of the three.

8 drank tea and a soft drink but not coffee.

9 drank a soft drink and coffee.

4 drank all three.

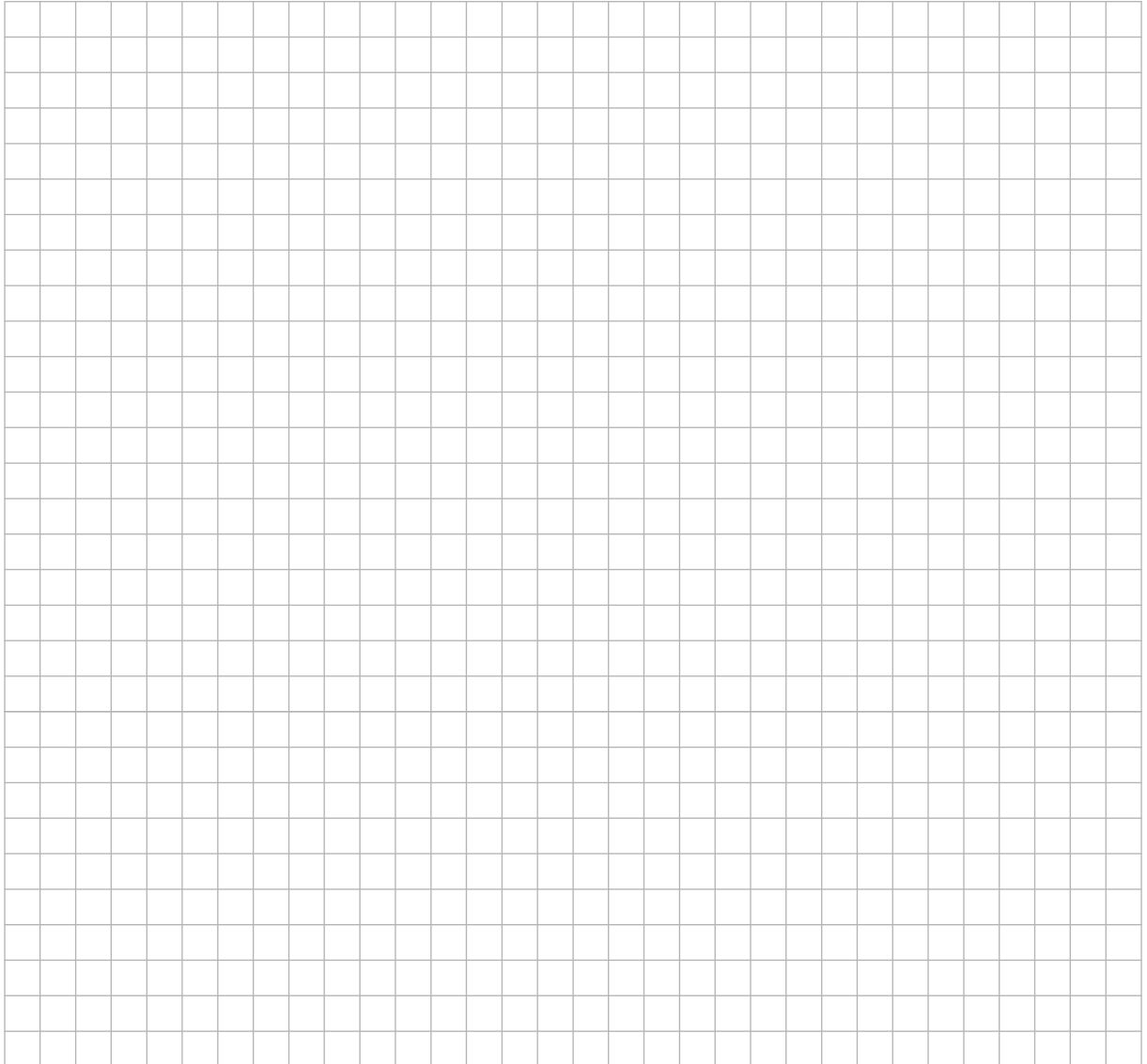
(a) Represent the above information on the Venn diagram



(b) Find the probability that a student chosen at random from the group had drunk tea or coffee.

(c) Find the probability that a student chosen at random from the group had drunk tea and coffee but not a soft drink.

- (c) If $n^2 - m^2$, $2nm$ and $n^2 + m^2$ are the lengths of the sides of a triangle, show that the triangle is right angled.

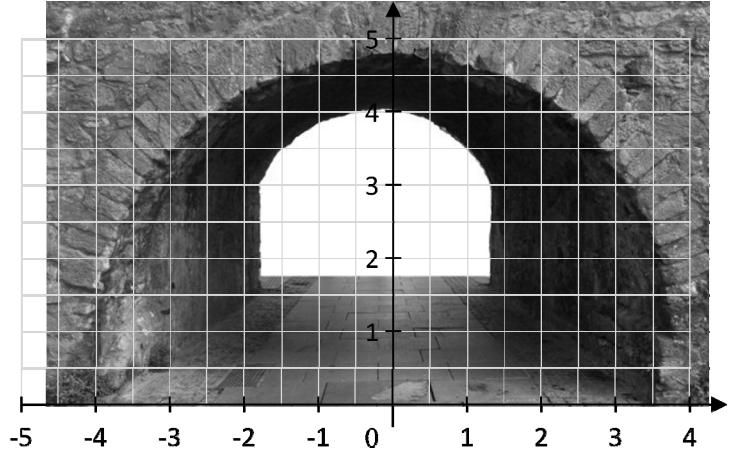


Question 8

(Suggested maximum time: 5 minutes)

The picture below shows the top section of the Spanish Arch in Galway city. George wants to see if the arch can be described by a function. He puts a co-ordinate grid over the arch as shown.

(a) Complete the table below to show the value of y for each of the given values of x .



x	y
-3	
-2	
-1	
0	
1	
2	
3	

(c) Is it possible to represent this section of the Spanish Arch by a quadratic function? Give a reason for your answer.

Answer: _____

Reason: _____

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Question 9

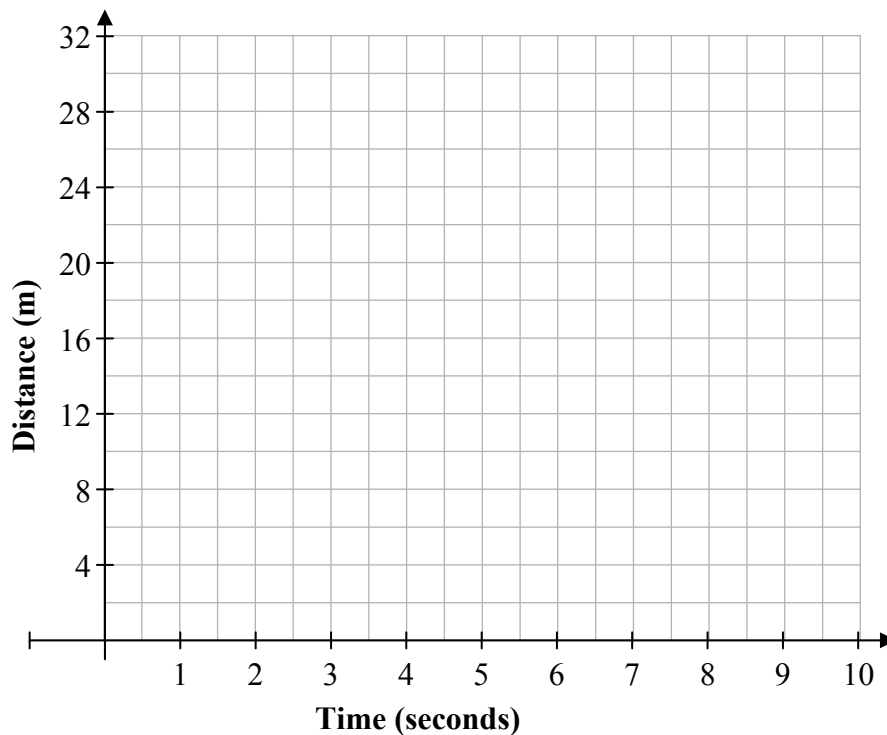
(Suggested maximum time: 10 minutes)

Bill and Jenny are two athletes running in the same direction at steady speeds on a race-track. Tina is standing beside the track. At a particular time, Bill has gone 7 m beyond Tina and his speed is 2 meters per second. At the same instant Jenny has gone 2 m beyond Tina and her speed is 3 meters per second.

- (a) Complete the table below to show the distance between the two runners and Tina over the next 10 seconds.

Time	Bill Distance (m)	Jenny Distance (m)
0	7	2
1	9	
2		
3		
4		
5		
6		
7		
8		
9		
10		

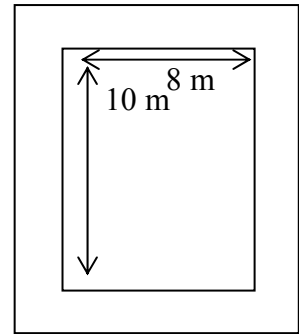
- (b) On the grid below draw graphs for the distance between Bill and Tina and the distance between Jenny and Tina over the 10 seconds.



Question 10

(Suggested maximum time: 20 minutes)

A plot consists of a garden measuring 8 m by 10 m surrounded by a path. The total area of the plot is 143 m². Three students, Kevin, Elaine and Tony, have been given the problem of trying to find the width of the path. Each of them is using a different method, but all of them are using x to represent the width of the path.

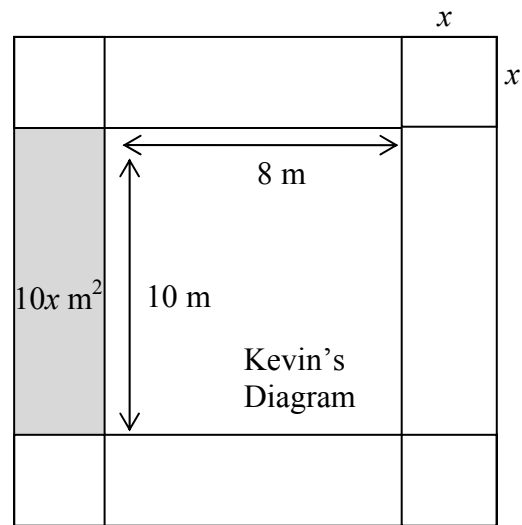


Kevin divides the path into eight sections as shown below. He writes down the area of each section in terms of x . He then forms an equation by setting the area of the path plus the area of the garden equal to the total area of the plot.

(a) Write, in terms of x , the area of each unshaded section into Kevin's diagram below.

(b) Write down and simplify the equation which you think Kevin got. Give your answer in the form $ax^2 + bx + c = 0$.

Equation:	

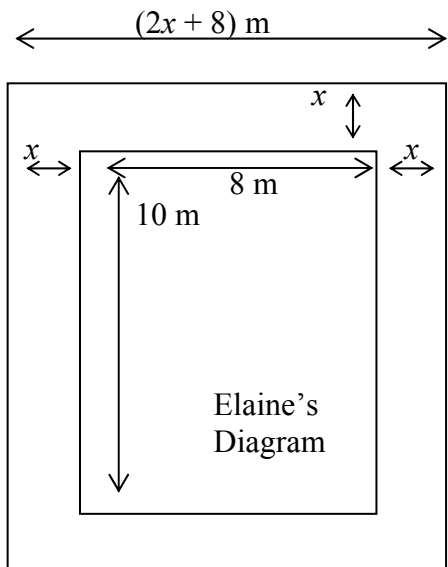


Elaine writes down the length and width of the plot in terms of x . She multiplies these and sets the answer equal to the total area of the plot.

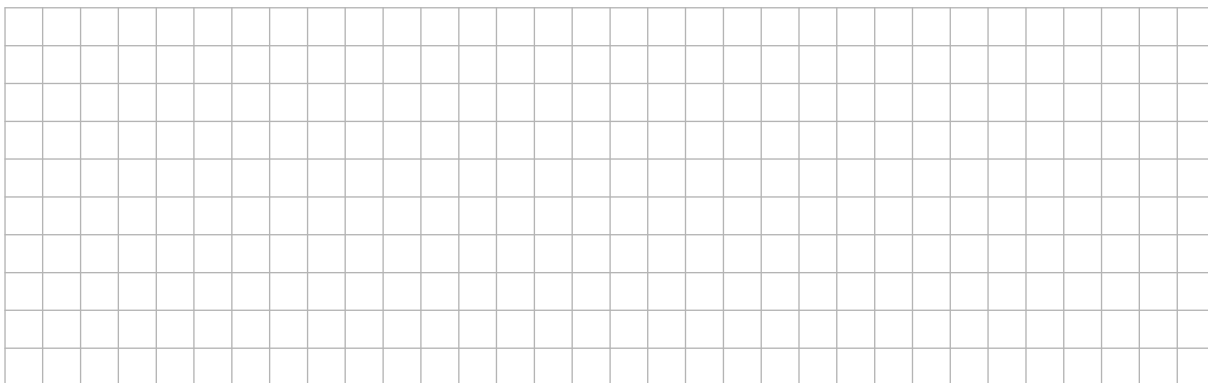
(c) The width of the plot is $(2x + 8)$ m. Write, in terms of x , the length of the plot on Elaine's diagram. _____

(d) Write down and simplify the equation which you think Elaine got. Give your answer in the form $ax^2 + bx + c = 0$.

Equation:	



(b) Solve your equations to find the value of a and the value of b .



(c) Write down the co-ordinates of the point where the curve crosses the y -axis. (,)

(d) Find the **points** where the curve crosses the x -axis. Give your answers correct to one place of decimals.



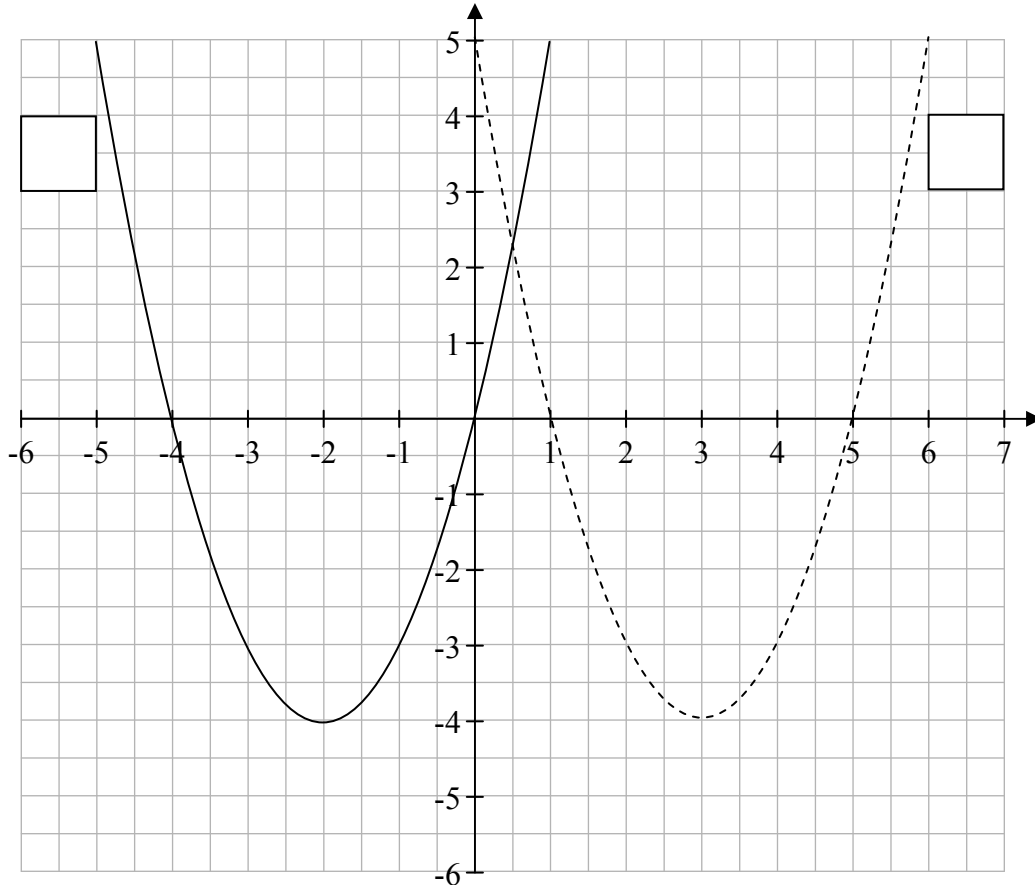
Question 14

(Suggested maximum time: 15 minutes)

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

$$f(x) = (x + 2)^2 - 4$$

$$g(x) = (x - 3)^2 - 4$$



- (a) Match the graphs to the functions by putting $f(x)$ or $g(x)$ beside the corresponding graphs on the grid.
- (b) Write down the roots of $f(x)$ and the roots of $g(x)$.

$f(x)$:														
$g(x)$:														

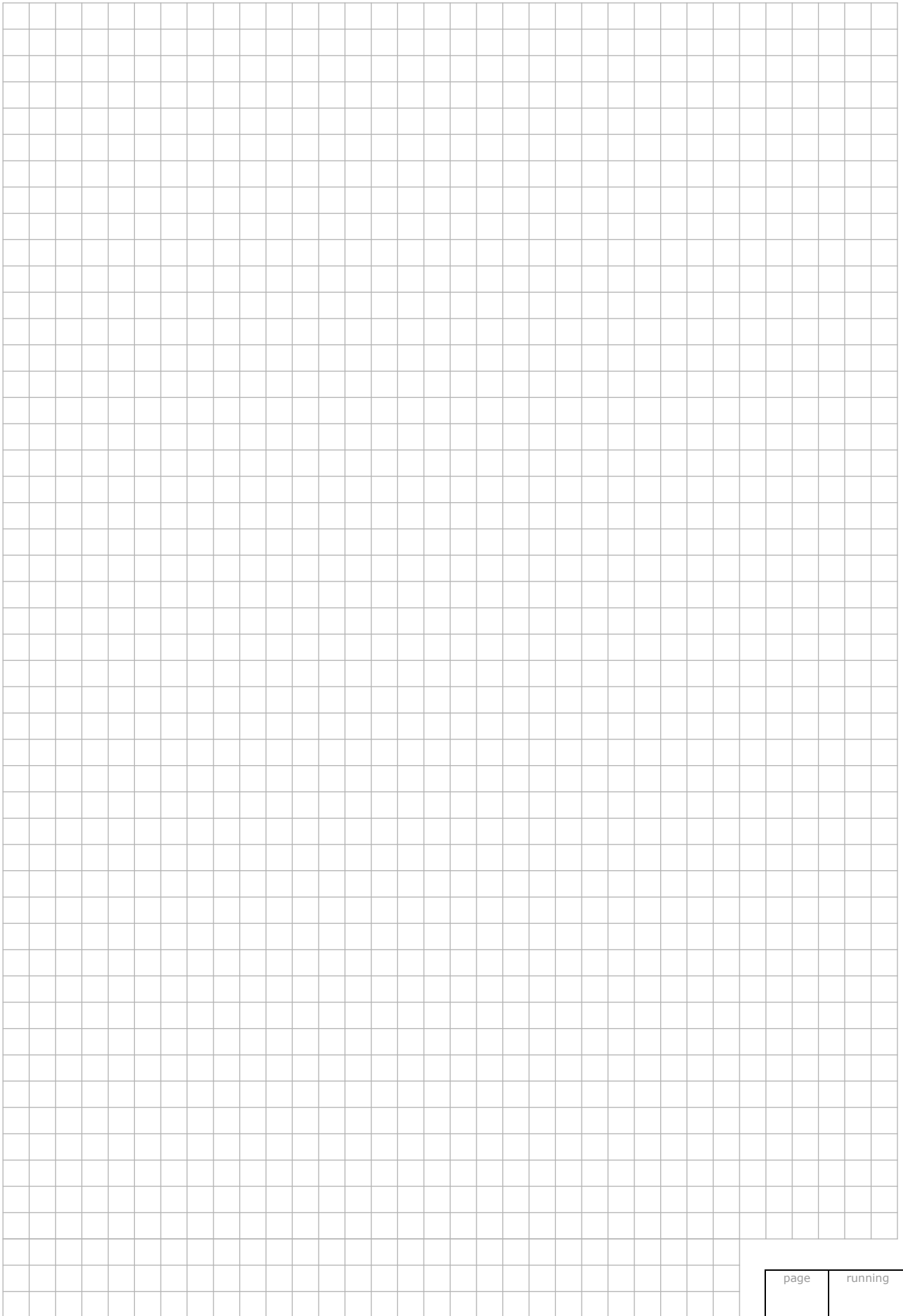
- (c) Sketch the graph of $h: x \mapsto (x - 1)^2 - 4$ on the grid above.

- (d) If $(x-h)^2 - 2 = x^2 - 10x + 23$, $h \in \mathbb{N}$. Find the value of h .

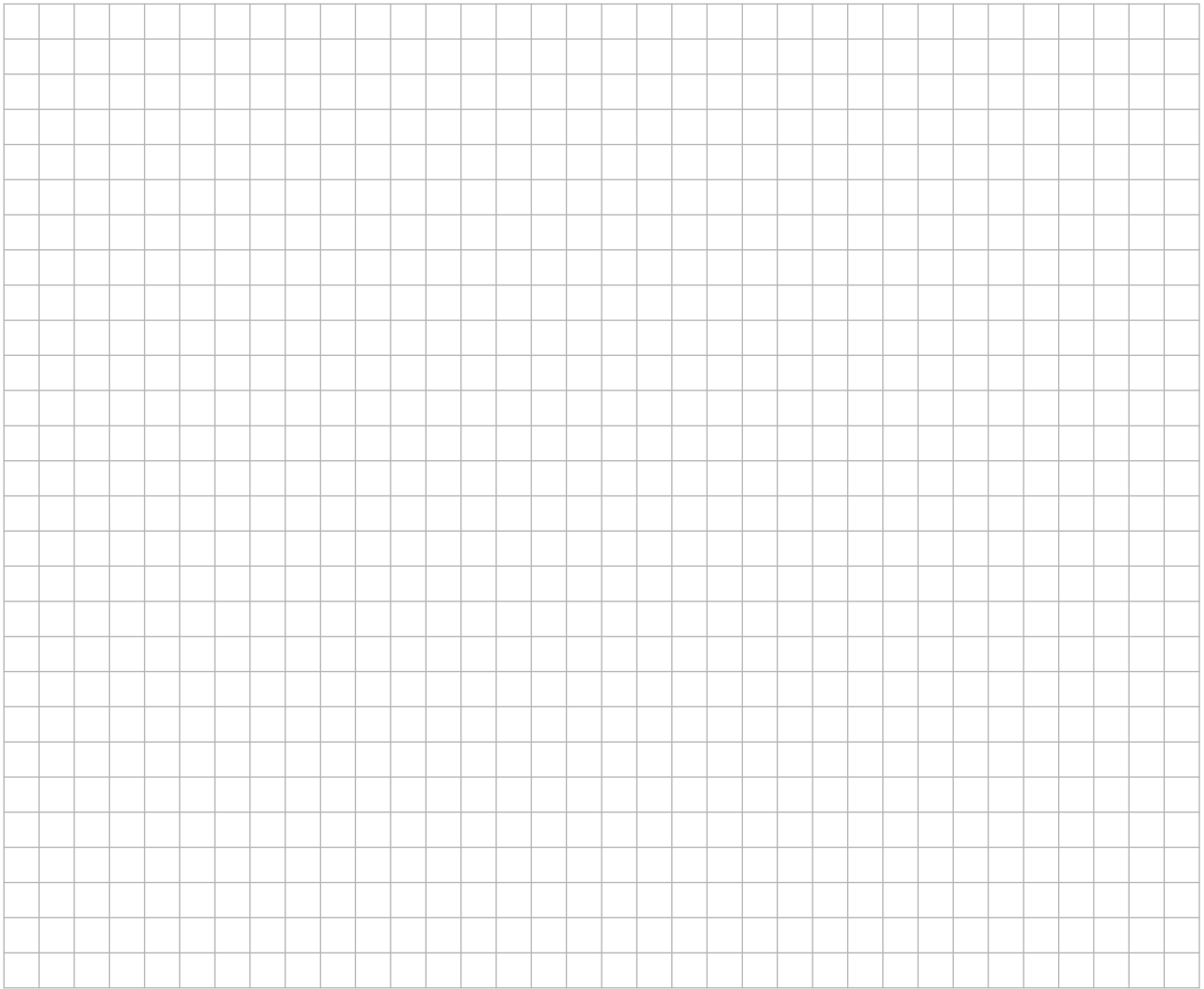


- (e) Write down the equation of the axis of symmetry of the graph of the function $f : x \mapsto x^2 - 10x + 23$.

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 teachers and candidates prepare for the June 2013 Mathematics examination in the *Project Maths* initial schools. The content and structure do not necessarily reflect the 2014 or subsequent examinations in the initial schools or in all other schools.

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

Junior Certificate – Higher Level

Mathematics (Project Maths – Phase 3) – Paper 1

Sample Paper, 2013

Time: 2 hours 30 minutes