



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination, 2013
Sample Paper

Mathematics
(Project Maths – Phase 3)

Paper 2

Ordinary Level

Time: 2 hours

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		16	
7			
8			
9			
10		Total	

Grade

Instructions

There are 16 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.

Questions do not necessarily carry equal 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 *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.

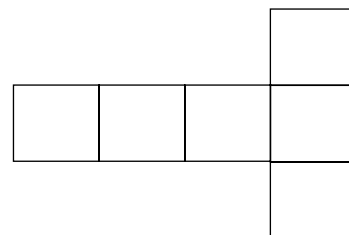
Answers should be given in simplest form, where relevant.

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

Question 1

(Suggested maximum time: 2 minutes)

The shape below, on the right, consists of 6 squares. Each side is 2 cm long. It can be folded to form a cube. Find the surface area of the cube.

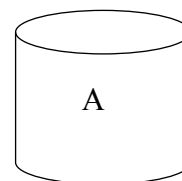
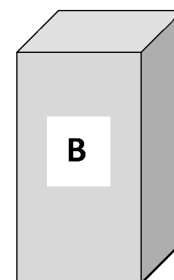
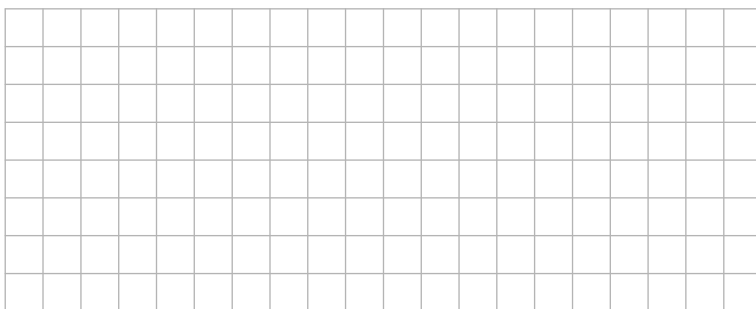


Question 2

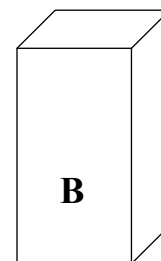
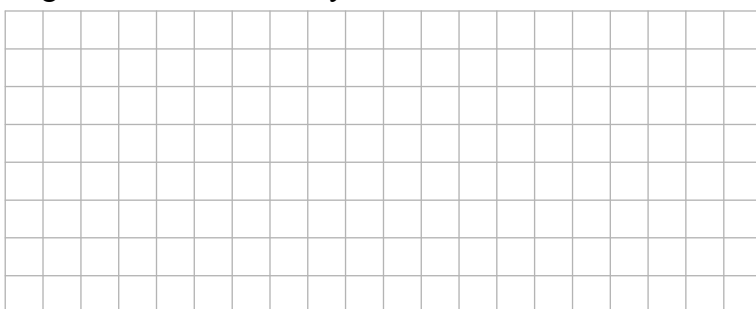
(Suggested maximum time: 10 minutes)

A food production company has to decide between a closed cylindrical tin A or a rectangular carton B to hold a product they are marketing for the first time. Both containers have the same volume.

- (a) Tin A has a radius of 3 cm and a height of 10 cm. Find the volume of tin A.



- (b) Carton B has a square base of length 5 cm. Use the volume you got in (a) above to find the height of carton B. Give your answer correct to one decimal place.



- (c) Which one of the above containers do you think the company might choose? Give a reason for your answer.

Container:	
Reason:	

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Question 3 (Suggested maximum time: 5 minutes)

Question 3 (Suggested maximum time: 5 minutes)

Mary is planning to fly to London. The table shows the flights leaving Dublin Airport (DUB) and arriving in London Heathrow Airport (LHR) on a particular day.

Departing		Arriving	
DUB	06:40	LHR	08:05
DUB	07:30	LHR	09:05
DUB	08:50	LHR	10:15
DUB	09:50	LHR	11:10
DUB	12:10	LHR	13:25
DUB	13:40	LHR	14:55
DUB	14:40	LHR	15:55
DUB	15:50	LHR	17:10

- (a) Mary needs to arrive in Heathrow by 10:30 am. What is the departure time of the latest flight that she can take from Dublin Airport?

- (b)** Find the time of her flight in hours and minutes.

- (c) Mary would like to arrive in Dublin Airport 75 minutes before that flight leaves. At what time should she arrive at the airport?

- (d) Mary checks in one bag. The cost of checking in a bag is €25. The fare summary for her journey is given in the table below. Find how much the taxes and charges amount to.

Fare Summary (€)	
From Dublin to London/Heathrow	
Fare	74.99
Taxes and Charges	
Baggage	25.00
Total	133.88

[illegible]

- (e) The distance from Dublin to London is 464 km. Find the average speed of the airplane during the flight, in km/h.

Question 4

(Suggested maximum time: 5 minutes)

A survey was conducted among third year students. The answers to survey questions can be classified as

- (i) Categorical data where the categories are not ordered
- (ii) Ordered categorical data
- (iii) Discrete numerical data
- (iv) Continuous numerical data

In each row in the table below, write a short question that you could include in a survey and that will give the type of data stated.

Question:	Type of data:
Q1.	Categorical data where the categories are not ordered
Q2.	Ordered categorical data
Q3.	Discrete numerical data
Q4.	Continuous numerical data

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

The following question was asked on the phase 9 *CensusAtSchool* questionnaire:
“Approximately how many hours per week do you spend on social networking sites?”

The data below are from two samples of students chosen at random from the UK and Ireland.

Number of hours	UK Number of students	Ireland Number of students
1		
2	1	1
3	2	3
4	1	2
5	2	2
6	7	2
7		3
8		
9	1	5
10		2
11		3
12		3
13	4	4
14	1	2
15	5	
16	5	5
17	2	1
18	4	2
19	5	4
20	3	2
21	2	
22	3	
23	1	
24		
25	1	4

(a) How many students are in each sample? UK _____ Ireland _____

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- This image shows a full page of blank graph paper. The grid consists of thin, light gray horizontal and vertical lines that intersect to form small squares across the entire surface. There are no margins, text, or other markings on the paper.

- [illegible]

Question 6 (Suggested maximum time: 10 minutes)

Question 6 (Suggested maximum time: 10 minutes)

A bag contains red disks, blue disks and white disks. In an experiment, each student in a class of 24 takes out a disk, records the colour and replaces it. This is repeated ten times.

The results from the class are recorded in the table below.

Colour	Red	Blue	White	Total
Frequency	123	78	39	
Relative frequency $\frac{\text{Frequency}}{\text{Total}}$				
% of total (Relative frequency $\times 100$)				

- (a)** In your opinion, why is the number recorded for red greater than for blue or white?

[illegible]

- (b)** Complete the table above.

- (c) Use the results from the table above to estimate the probability of getting each colour when a disk is taken from the bag.

Colour	Red	Blue	White
Probability			

- (d) Anne says that she thinks there are ten discs in the bag. Is this a reasonable suggestion? Explain your answer.

[illegible]

- (e) Based on the information in the table, how many disks of each colour do you think are in the bag? Give a reason for your answer.

[illegible]

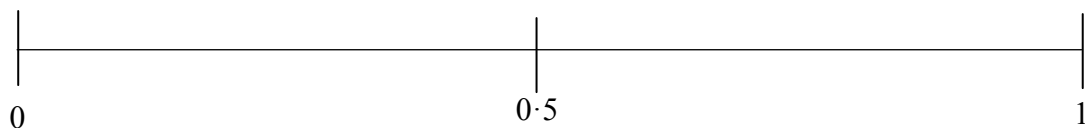
Question 7 (Suggested maximum time: 10 minutes)

Question 7 (Suggested maximum time: 10 minutes)

- (a) Estimate the probability for each of the events **A**, **B**, **C**, **D** and **E** listed below, and write your answers into the table.

	Probability
<p>A name is picked at random from a list of 50 girls and 50 boys.</p> <p>A = A girl's name is picked.</p>	
<p>A fair coin is tossed once.</p> <p>B = A head is the outcome.</p>	
<p>One card is drawn at random from a pack of playing cards.</p> <p>C = The card is a diamond.</p>	
<p>A day is chosen at random from a list of the days of the week.</p> <p>D = The name of the day contains the letter a.</p>	
<p>One number is picked at random from the set {1, 2, 3, 4, 5, 7, 11, 13}.</p> <p>E = The number chosen is a prime number.</p>	

- (b)** Place the letter for each of the events at the most appropriate position on the probability scale below.



- (c) Write down another event that you think has a probability similar to that of **C** in the scale above.

- (d) Write down another event that you think has a probability similar to that of **D** in the scale above.

- (e) In a multiple choice quiz, three possible answers are given to a question. James does not know the answer and guesses which one is correct. Put an X on the scale above to show the probability that he has chosen the correct answer.

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Question 8

(Suggested maximum time: 5 minutes)

- (a)** The mean of a list of five numbers is 8.
Write down two different lists of numbers for which the above statement is true.

[illegible]

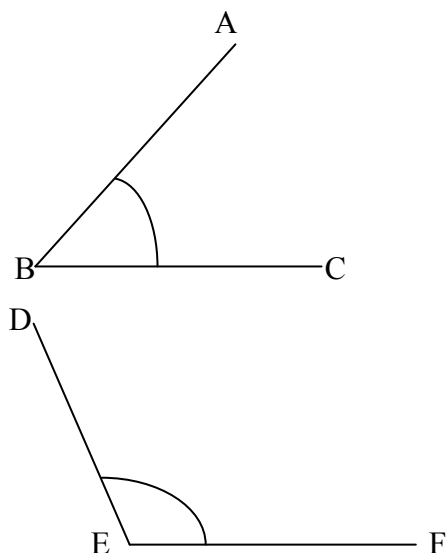
- (b)** The mode of a list of six numbers is 7.
Write down two different lists of numbers for which the above statement is true.

[illegible]

Question 9

(Suggested maximum time: 5 minutes)

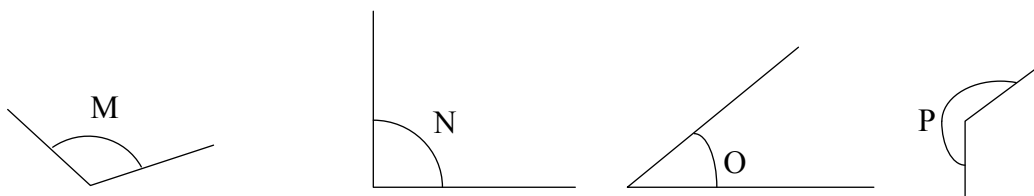
- (a)** Use a protractor to measure $\angle ABC$ and $\angle DEF$.



$|\angle ABC| = \underline{\hspace{2cm}}$

$$|\angle DEF| = \underline{\hspace{2cm}}$$

- (b)** The four angles $\angle M$, $\angle N$, $\angle O$ and $\angle P$ are shown in the diagrams below.



Starting with the smallest, arrange the four angles in order of magnitude.

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Question 10

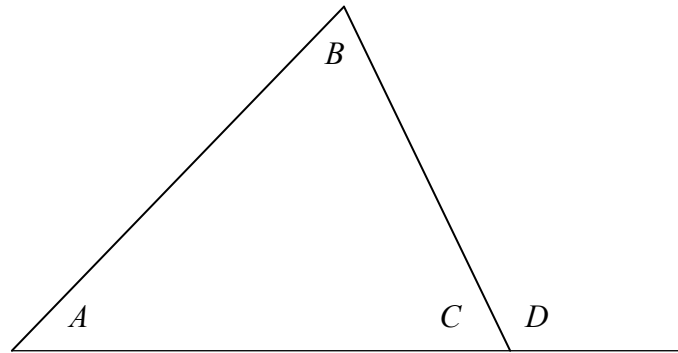
(Suggested maximum time: 10 minutes)

- (a) From the diagram opposite write down three angles which together add up to 180° .

$$\square + \square + \square = 180^\circ$$

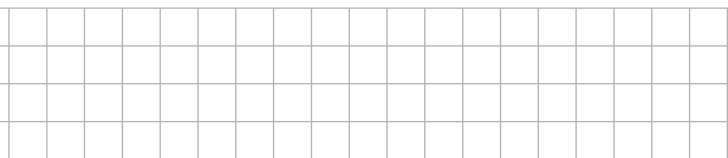
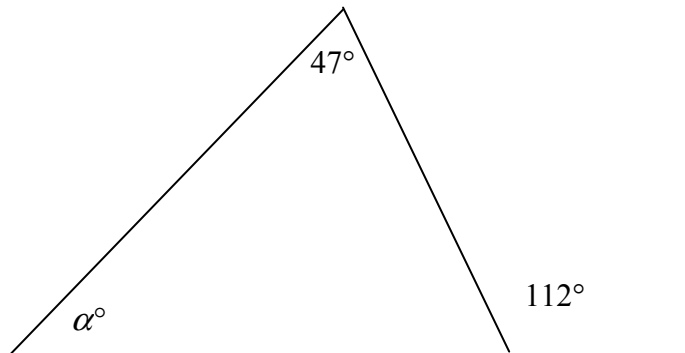
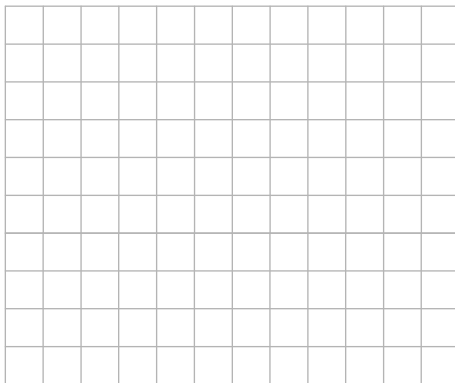
- (b) From the diagram opposite write down two angles which together add up to 180° .

$$\square + \square = 180^\circ$$



- (c) What can you conclude from your two statements about the relationship between $|\angle D|$ and $(|\angle A| + |\angle B|)$

- (d) Find α in the diagram.



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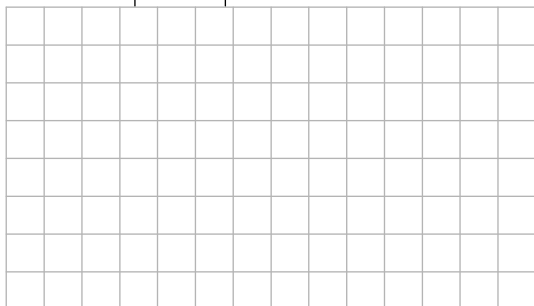
Question 11

(Suggested maximum time: 15 minutes)

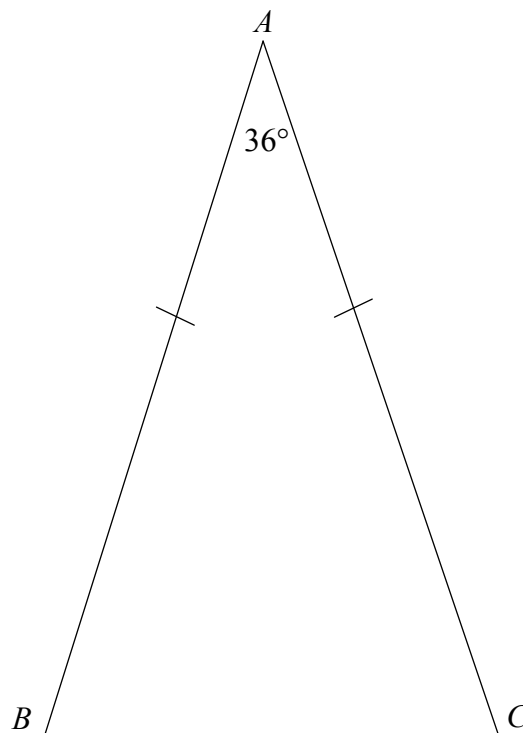
The triangle ABC is isosceles.

$$|\angle BAC| = 36^\circ.$$

- (a) Calculate $|\angle ACB|$.

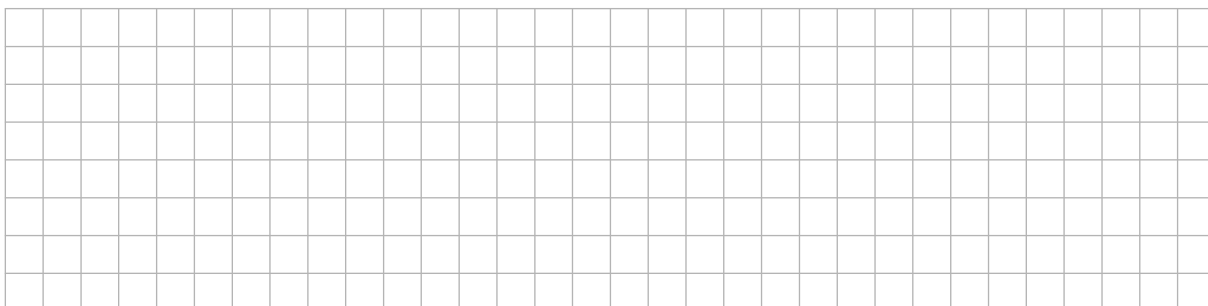


- (b) On the diagram construct the bisector of $\angle ABC$. Show all construction lines clearly.

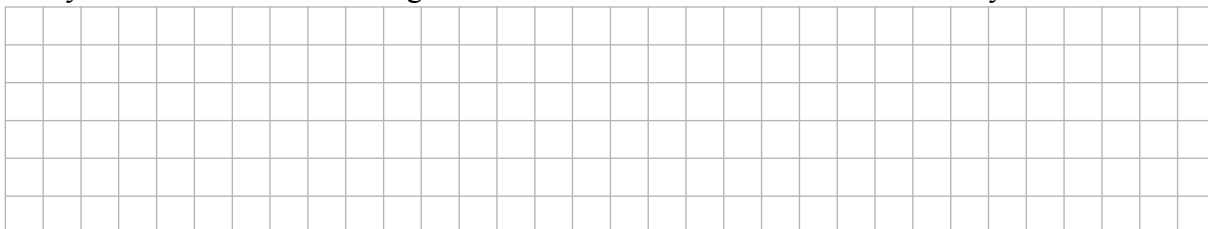


- (c) Mark in the point D where your bisector meets the line AC .

- (d) Calculate all the angles in the triangle BDC and write them into the diagram.



- (e) Can you conclude that the triangle BDC is also isosceles? Give a reason for your answer.



- (f) Measure $|AC|$ and $|BC|$.

$$|AC| = \text{_____ cm}$$

$$|BC| = \text{_____ cm}$$

- (g) Calculate the ratio $\frac{|AC|}{|BC|}$ correct to three places of decimals.

$$\frac{|AC|}{|BC|} = \text{_____}$$

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

During a trigonometry lesson a group of students made some predictions about what they expected to find for the values of the trigonometric functions of some angles. They then found the sine, cosine and tangent of 25° and 50° .

- (a) In the table given, show, correct to three decimal places, the values they found.

$\sin 25^\circ =$	$\cos 25^\circ =$	$\tan 25^\circ =$
$\sin 50^\circ =$	$\cos 50^\circ =$	$\tan 50^\circ =$

- (b) (i) Maria had said “The value from any of these trigonometric functions will always be less than 1”. Was Maria correct? Give a reason for your answer.

Answer:

Reason:

- (ii) Sharon had said “If the size of the angle is doubled then the value from any of these trigonometric functions will also double.” Was Sharon correct? Give a reason for your answer.

Answer:

Reason:

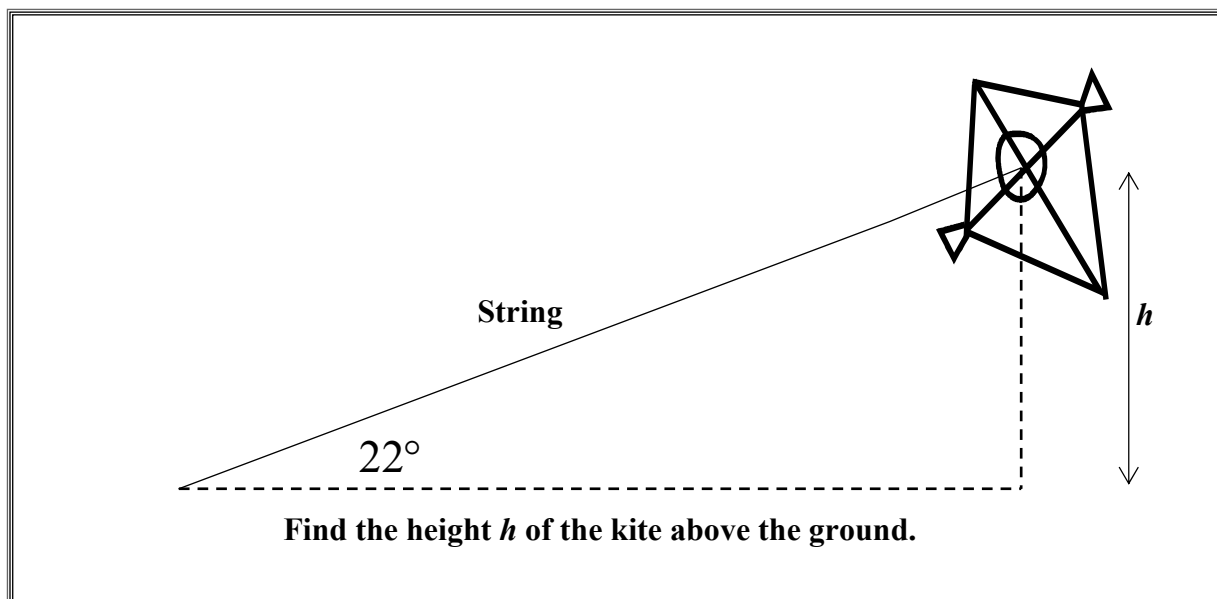
- (iii) James had said “The value from all of these trigonometric functions will increase if the size of the angle is increased.” Was James correct? Give a reason for your answer.

Answer:

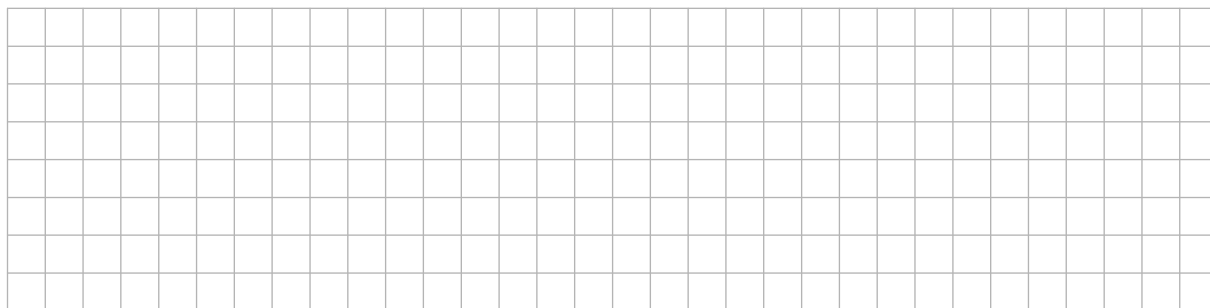
Reason:

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

Anne wanted to create a question which would use $\sin 22^\circ$ in its solution. She drew the diagram and wrote the question in the box below.

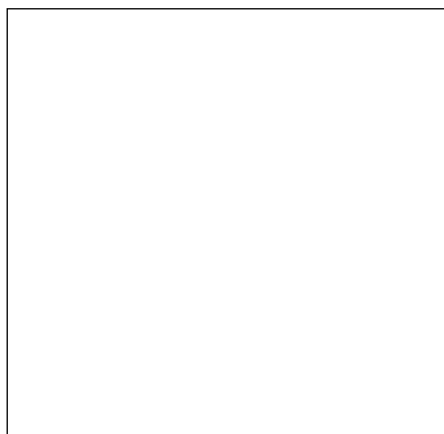


- (a) Anne has not enough information to answer the question. Put in an appropriate measurement on the diagram to complete it for her.
- (b) Using your measurement, find the height h in the diagram.

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

The following diagram shows a square.

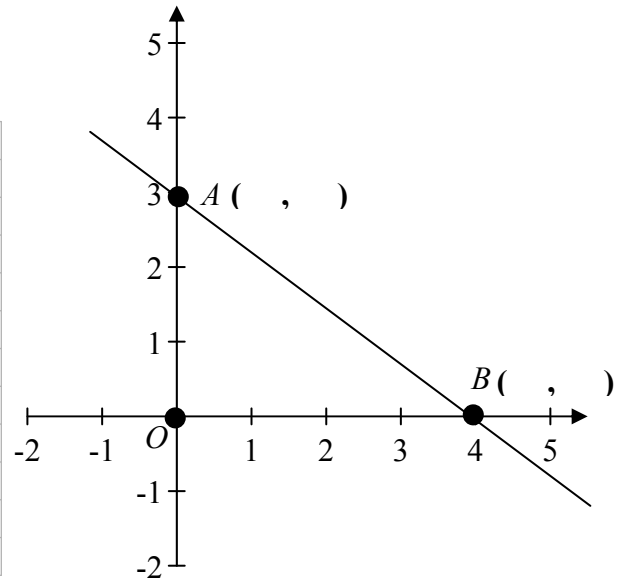
Draw in all its axes of symmetry.



Question 15

(Suggested maximum time: 5 minutes)

- (a) Write down the coordinates of the point A and the point B on the diagram.
- (b) Use the distance formula to find $|AB|$.



- (c) Write down the distance from O to A and the distance from O to B .

$ OA =$	
$ OB =$	

- (d) Use the theorem of Pythagoras to find the length of the hypotenuse of the triangle OAB .

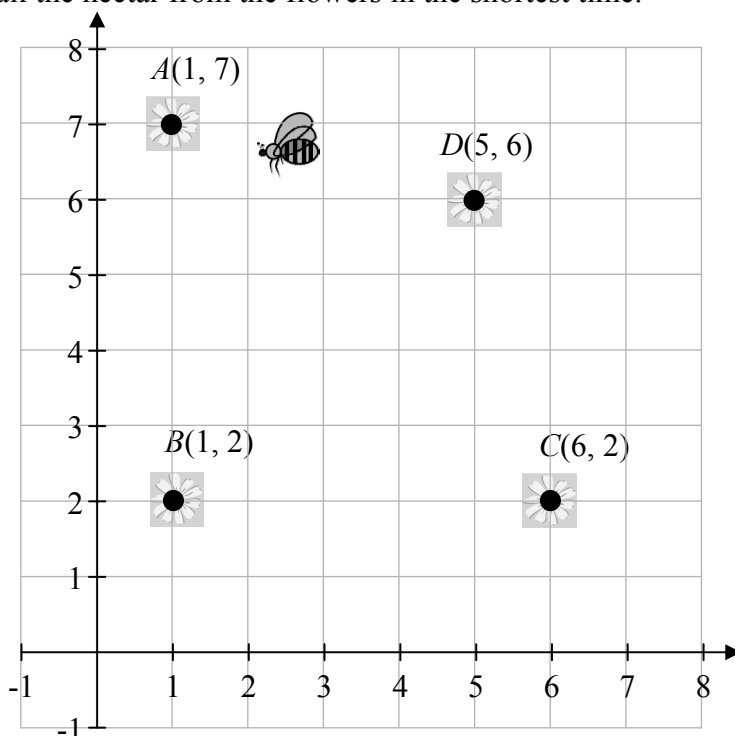


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Question 16 (Suggested maximum time: 5 minutes)

Question 16 (Suggested maximum time: 5 minutes)

A computer game shows the location of four flowers $A(1, 7)$, $B(1, 2)$, $C(6, 2)$, and $D(5, 6)$ on a grid. The object of the game is to collect all the nectar from the flowers in the shortest time.



- (a) A bee found a hidden flower half way between flower B and flower D . Find the coordinates of this hidden flower.

[illegible]

- (b)** Another flower E can be located by completing the square $ABCE$. Write down the coordinates of the point E .

$$E =$$

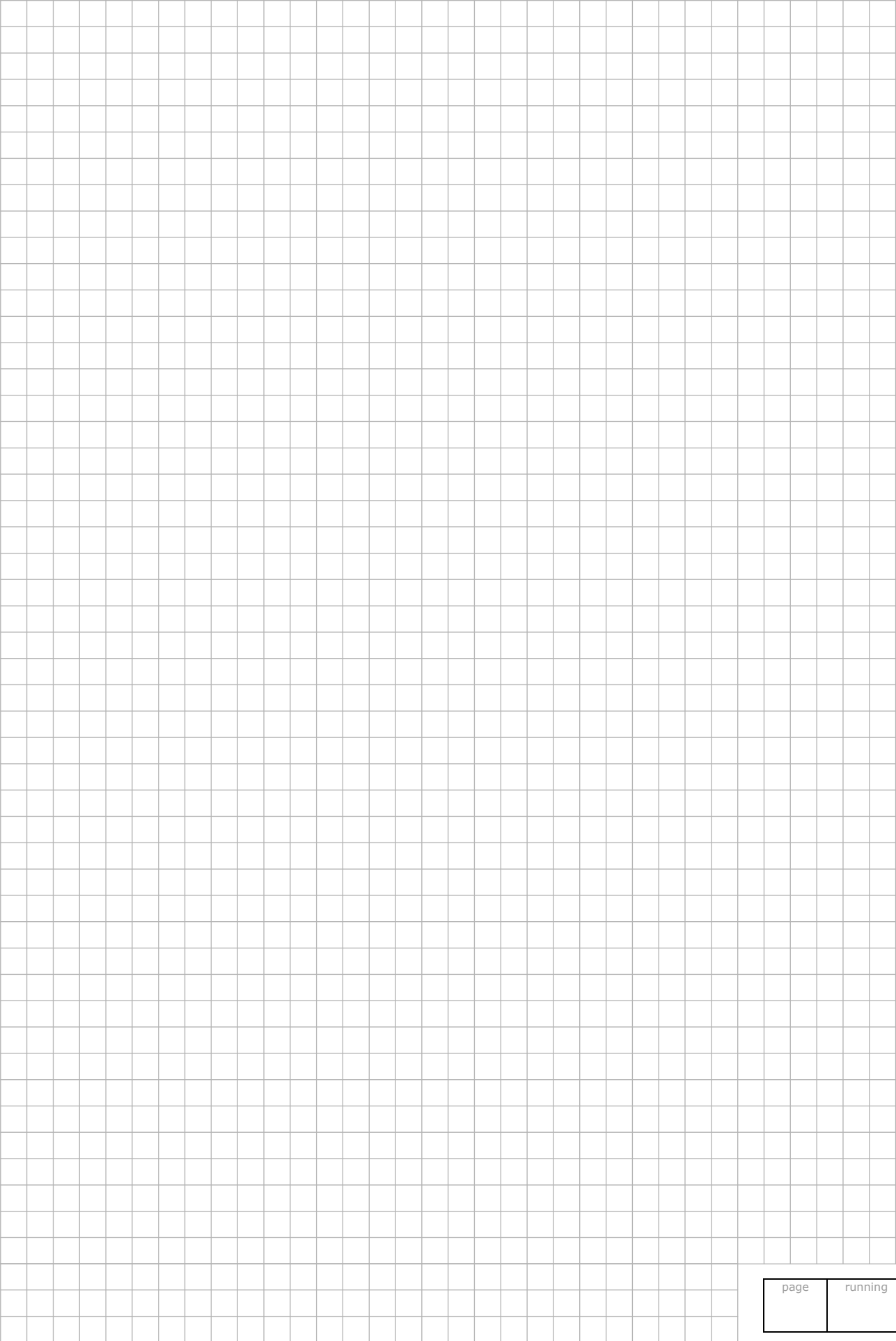
- (c) Bee 1 and Bee 2 are on flower A . Bee 1 flies directly from flower A to B and then on to C . Bee 2 flies from flower A directly to D and then on to C . Write down which bee has travelled the shortest total distance. Give a reason for your answer.

Answer: _____

Reason:

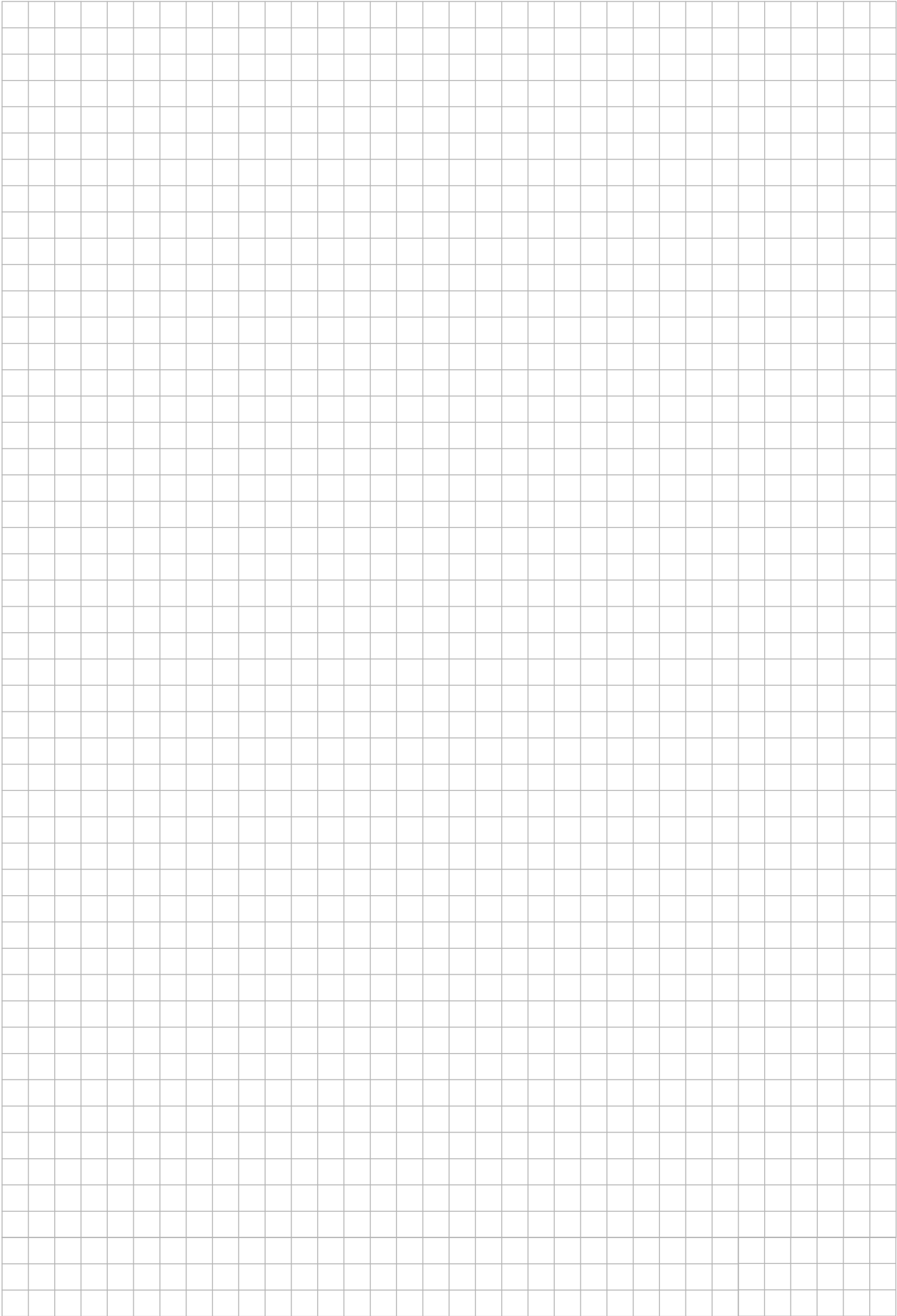
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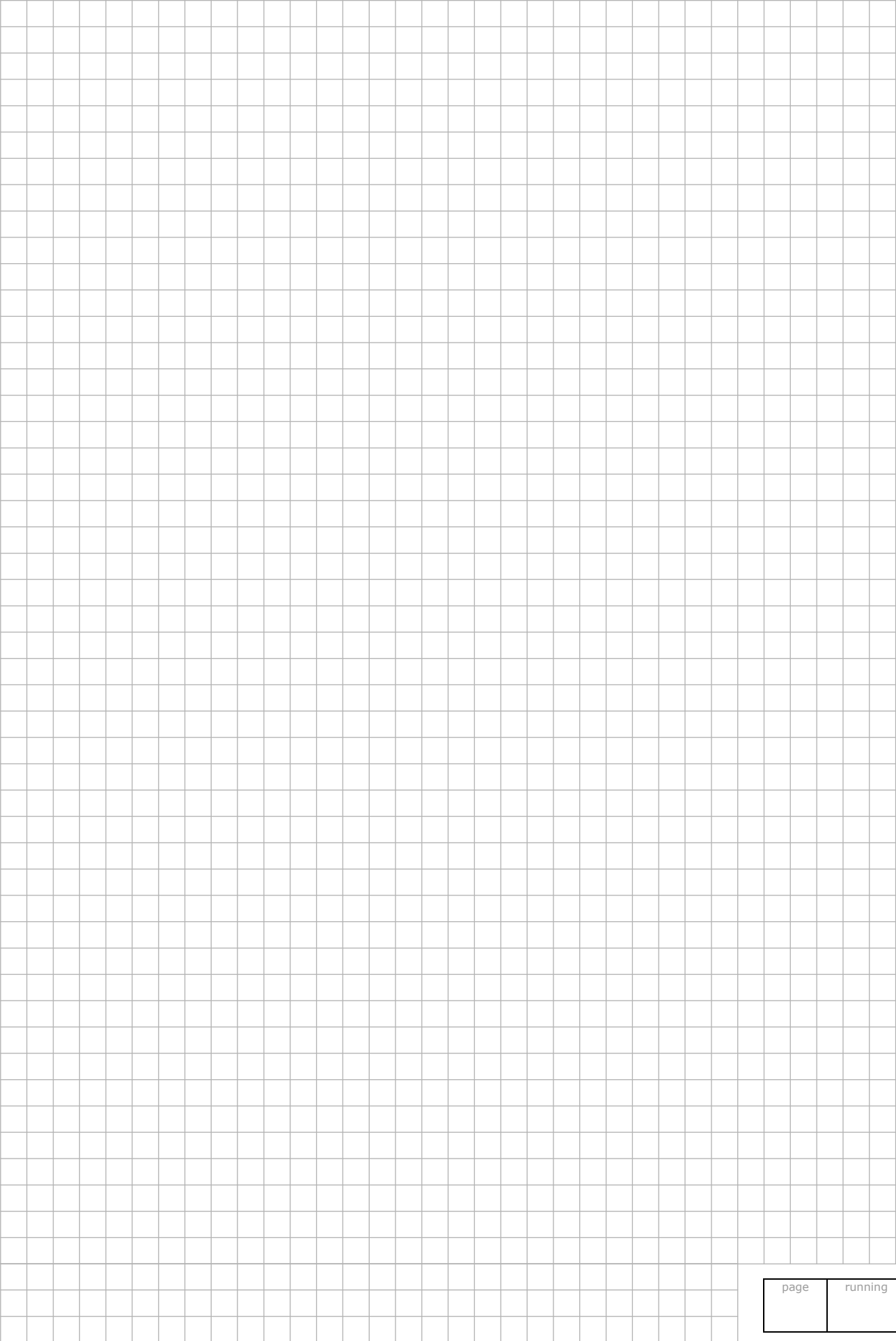


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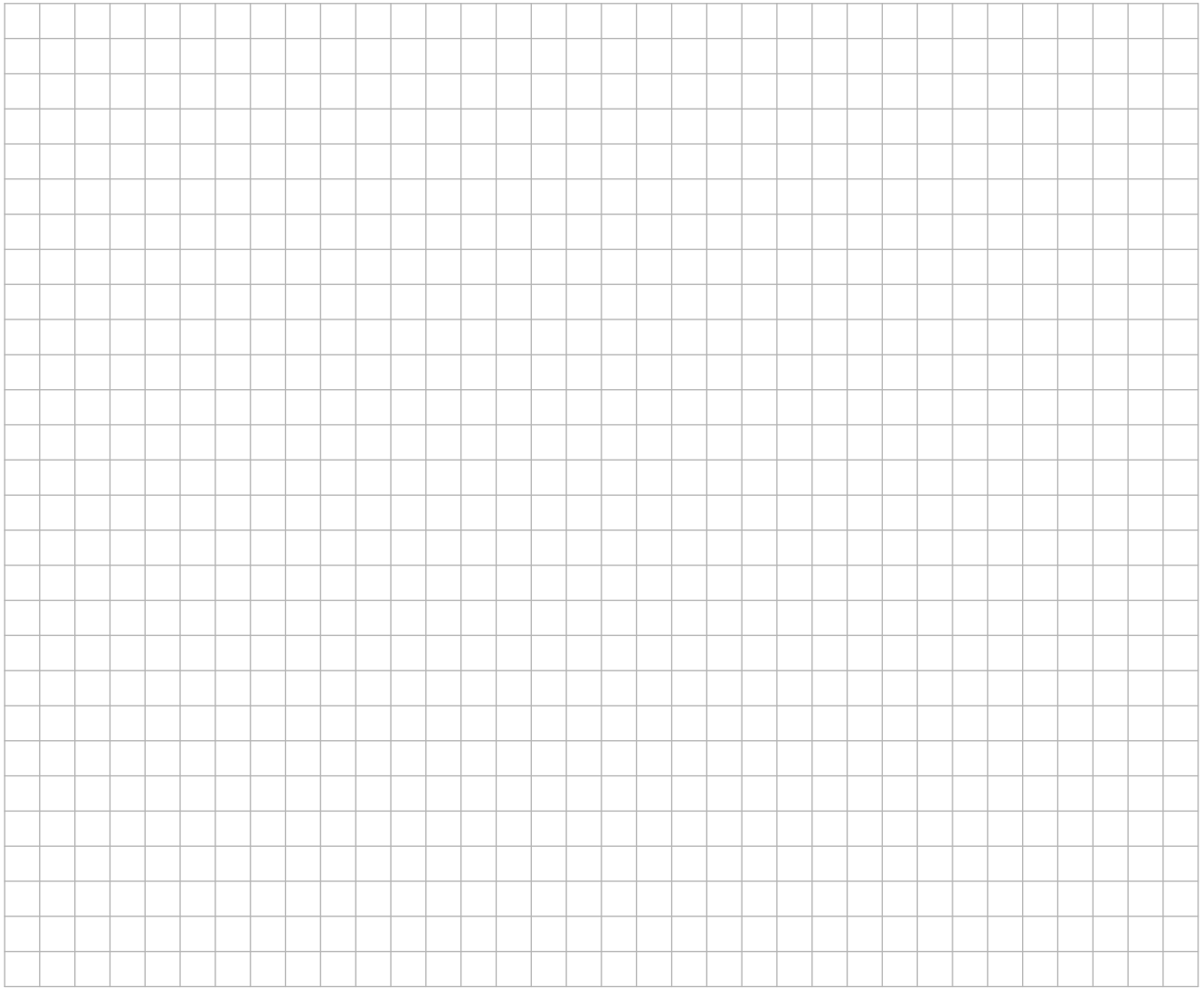
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Note to readers of this document:

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 – Ordinary Level

Mathematics (Project Maths – Phase 3) – Paper 2

Sample Paper, 2013

Time: 2 hours