Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0565258505

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/53**

Paper 5 Investigation (Core) **May/June 2023**

1 hour 10 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a graphic display calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly, including sketches, to gain full marks for correct methods.
- In this paper you will be awarded marks for providing full reasons, examples and steps in your working to communicate your mathematics clearly and precisely.

INFORMATION

- The total mark for this paper is 36.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **8** pages. Any blank pages are indicated.

DC (CJ/CB) 315834/1
© UCLES 2023

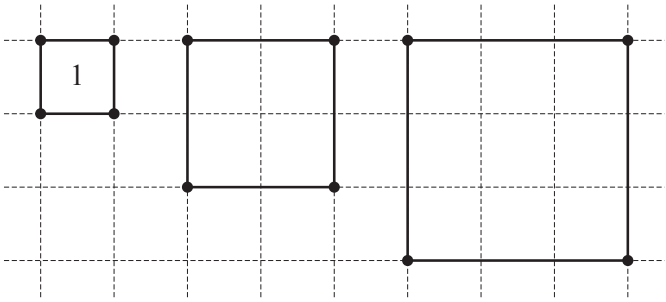
[Turn over

Answer **all** the questions.

INVESTIGATION **AREA OF A RHOMBUS**

This investigation looks at the area of a rhombus drawn on a square grid.

1

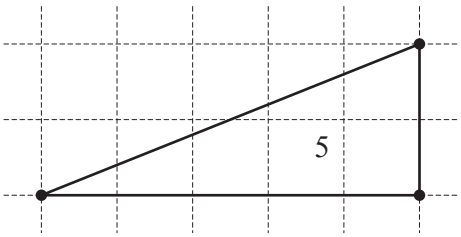


The first square has area 1.

Find the area of each square in the diagram.
Write your answer inside each square. [2]

2 Area of a triangle $= \frac{1}{2} \times$ base $\times$ height

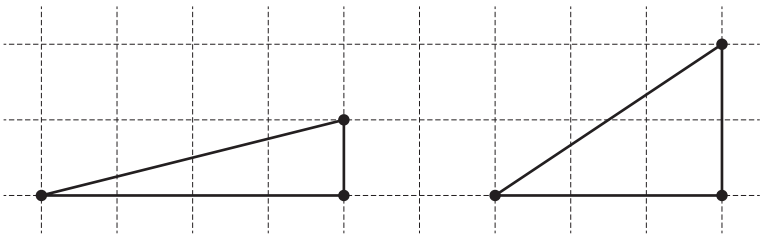
(a)



Show that the area of this triangle is 5.

[1]

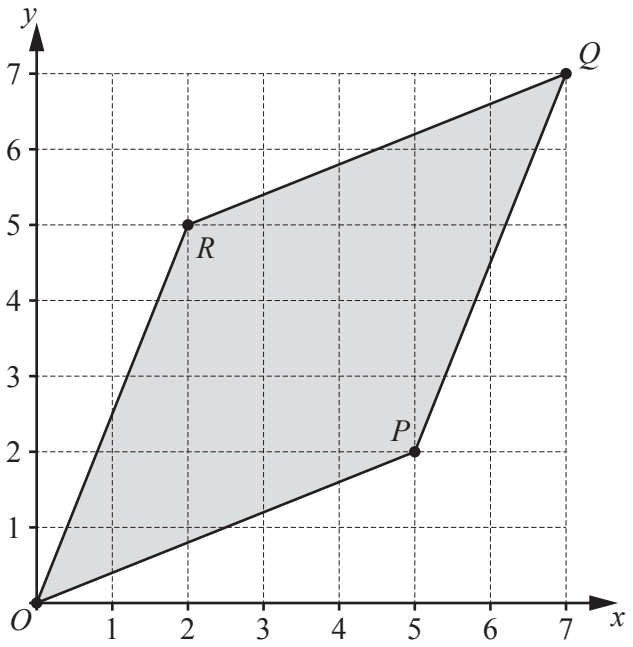
(b)



Find the area of each triangle.
Write your answer inside each triangle.

[3]

3 (a)

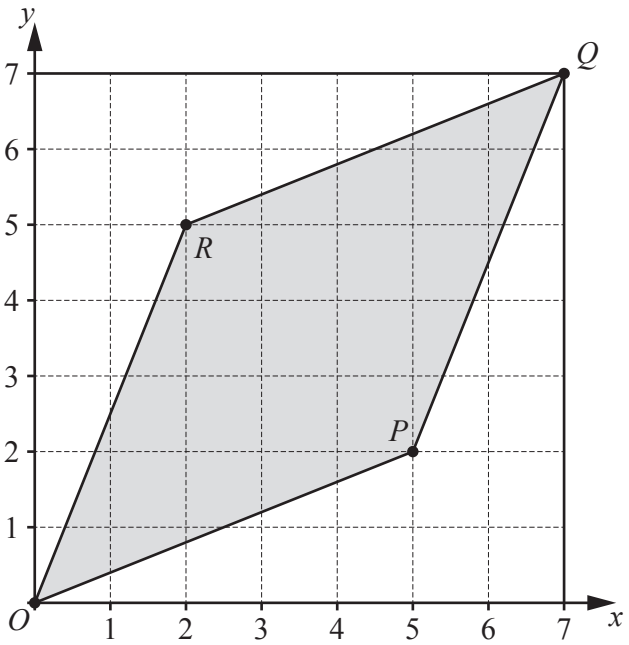


Give a reason why *OPQR* is a rhombus.

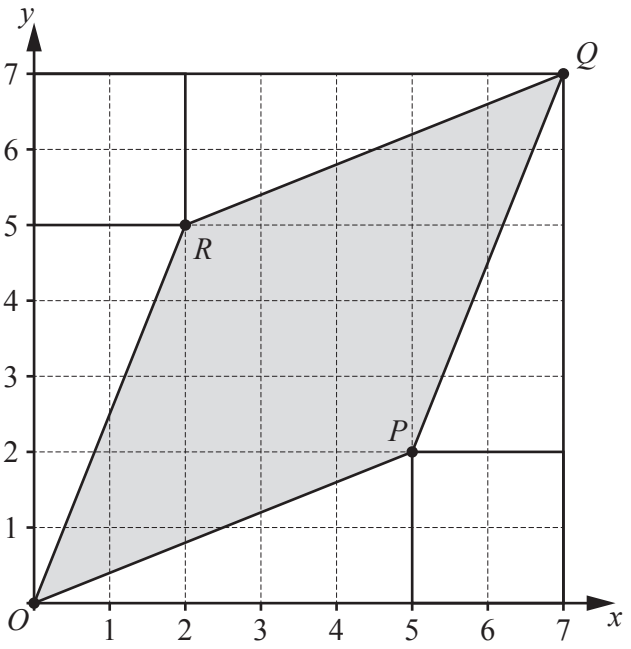
..... [1]

(b) These steps are the start of a method to find the area of the rhombus $OPQR$.

Step 1 Draw a square around the rhombus.



Step 2
Fill the space between the square and the rhombus with two congruent squares and four congruent triangles.



(i) Find the area of the large square that goes around the rhombus.

..... [2]

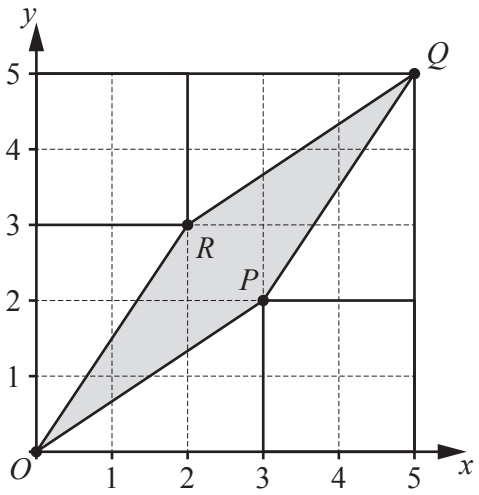
(ii) Use some of the results in **Question 1** and **Question 2** to write the areas of the two congruent squares and the four congruent triangles inside each shape. [1]

(iii) Use your answers to **part (i)** and **part (ii)** to show that the area of the rhombus is 21.

[1]

© UCLES 2023

4

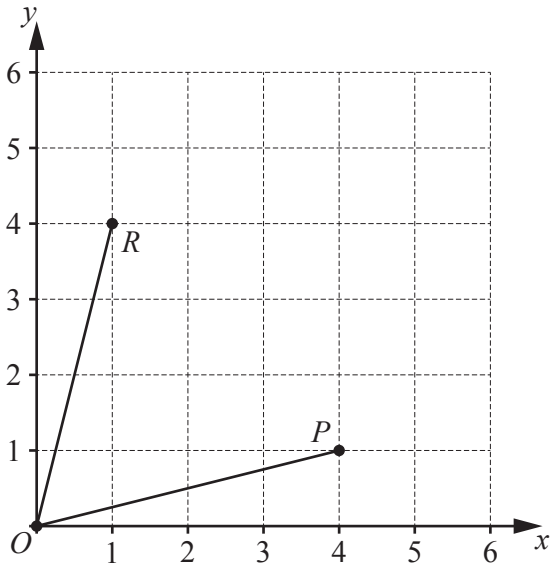


The diagram shows another rhombus *OPQR*.

Use the method of **Question 3(b)** to find its area.

..... [4]

5 **(a)**



On the diagram, complete the rhombus *OPQR*. [1]

(b) Use the method of **Question 3(b)** to find the area of rhombus *OPQR* that you completed in **part (a)**.

..... [4]

6 Throughout this investigation, O is the origin, and the x-coordinate and the y-coordinate of Q are always equal.

Complete the table using your answers to **Question 4** and **Question 5** and any patterns you notice.

	Area of rhombus $OPQR$	P	Q		
	21	(5, 2)	(7, 7)	$5^2 - 2^2$	$= 21$
Question 4		(3, 2)	(5, 5)	$3^2 - 2^2$	$=$
Question 5		(4, 1)		$4^2 - 1^2$	$=$
	33	(7, 4)	(11, 11)		$= 33$
	56	(9, 5)			
	27		(9, 9)	$6^2 - 3^2$	$=$

[8]

© UCLES 2023

7 $OPQR$ is a rhombus with $O(0, 0)$ and $P(a, b)$ where $a > b$.

(a) Use the table in **Question 6** to

(i) write down the coordinates of Q in terms of a and b

(..... , ...) [1]

(ii) write an expression for the area of rhombus $OPQR$ in terms of a and b.

..... [1]

(b) Q is the point (10, 10).
a and b are natural numbers.

(i) Use your answers to **part (a)** to find all the possible areas of the rhombus.

..... [4]

(ii) What is the mathematical name of the shape when the rhombus has an area of 100?

..... [2]

© UCLES 2023

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

© UCLES 2023