Cambridge Assessment International Education

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6066227181

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/51**

Paper 5 Investigation (Core) **October/November 2022**

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 **12** pages.

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Answer **all** the questions.

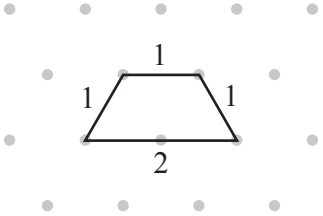
INVESTIGATION ISOSCELES TRAPEZIUMS

This investigation looks at the perimeter of isosceles trapeziums drawn on 1 cm isometric grids and the number of unit equilateral triangles in these trapeziums.

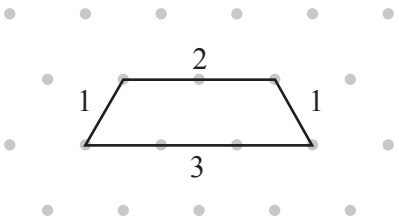
There is a spare isometric grid on page 12.

1 The diagrams show a sequence of trapeziums.
The *sloping side length* is 1.
Both parallel sides increase in length by 1 each time.

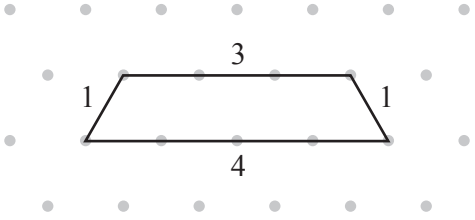
This is the first trapezium in the sequence.
The length of the shorter parallel side is 1.



This is the second trapezium in the sequence.
The length of the shorter parallel side is 2.



This is the third trapezium in the sequence.
The length of the shorter parallel side is 3.



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(a) Draw the next trapezium in the sequence.

[1]

(b) Complete the table.

Shorter parallel side length (x)	Longer parallel side length	Perimeter
1	2	5
2		
3	4	9
4		

[2]

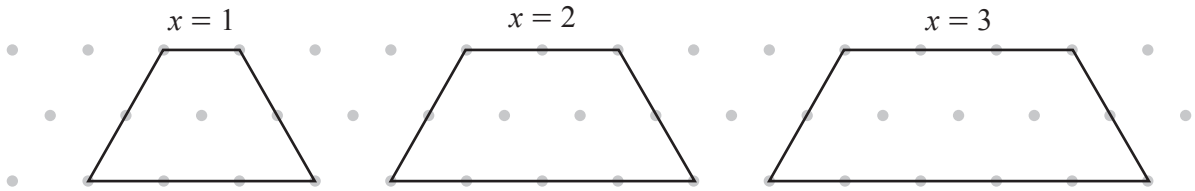
(c) Write down an expression, in terms of x, for the length of the longer parallel side.

..... [1]

(d) Find an expression, in terms of x, for the perimeter.
Give your answer in its simplest form.

..... [2]

2 The diagram shows another sequence of trapeziums.
Each trapezium has sloping side length 2.
Both parallel sides increase in length by 1 each time.



(a) Draw the trapezium with sloping side length 2 and $x = 5$.

[1]

(b) Complete the table.

Shorter parallel side length (x)	Longer parallel side length	Perimeter
1	3	8
2	4	
3	5	
4	6	14
5		

[2]

(c) Write down an expression, in terms of x, for the length of the longer parallel side.

..... [1]

(d) Find an expression, in terms of x, for the perimeter.
Give your answer in its simplest form.

..... [2]

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3 In another sequence each trapezium has sloping side length 3.
The length of the shorter parallel side is x.

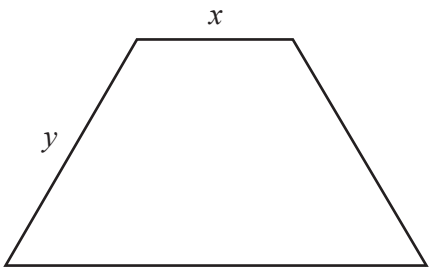
(a) Find an expression, in terms of x, for the length of the longer parallel side of the trapeziums with sloping side length 3.
You may use the grid below to help you.

..... [2]

(b) Show that an expression, in terms of x, for the perimeter is $2x + 9$.

[1]

4



In each trapezium:
- the shorter parallel side length is x
- each sloping side length is y.

(a) Write down an expression, in terms of x and y, for the length of the longer parallel side.
You may use your expressions from **Questions 1(c)**, **2(c)** and **3(a)** to help you.

..... [1]

(b) Find an expression, in terms of x and y, for the perimeter.
Give your answer in its simplest form.

..... [2]

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(c) Show that your expression in **part (b)** gives the correct result when $x = 2$ and $y = 5$.

[3]

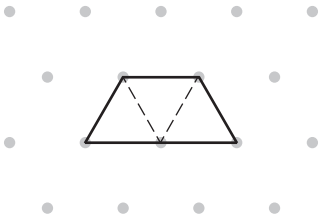
(d) A trapezium has shorter parallel side length x and sloping side length x.

Find an expression, in terms of x, for the perimeter.
Give your answer in its simplest form.

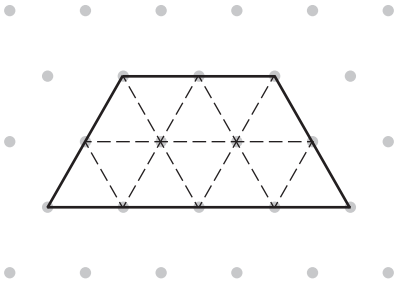
..... [2]

5 A *unit triangle* is an equilateral triangle of side length 1.

There are 3 unit triangles in this trapezium with $x = 1$ and $y = 1$.



There are 12 unit triangles in this trapezium with $x = 2$ and $y = 2$.



(a) Work out the number of unit triangles in a trapezium with $x = 1$ and $y = 3$.
You may use the grid below to help you.

..... [2]

(b) Complete the table.
You may use the grid below to help you.

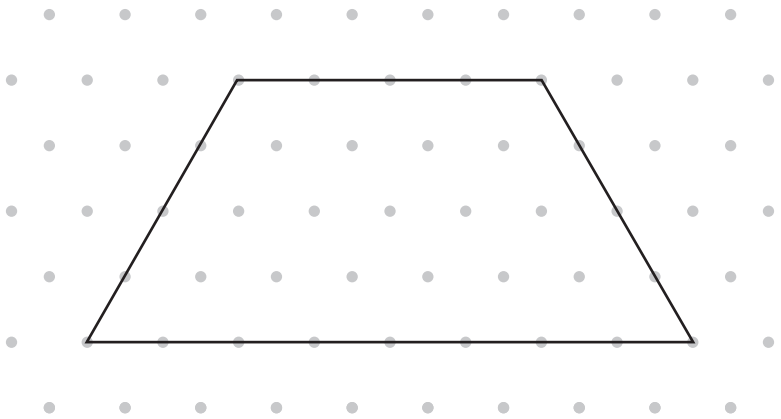
Shorter parallel side length (x)	Sloping side length (y)	Number of unit triangles
1	1	3
2	1	
3	1	
1	2	
2	2	12
3	2	
1	3	
2	3	
3	3	27

[3]

6 In a different sequence of trapeziums the shorter parallel side length, x, is equal to the sloping side length, y.

(a) The diagram shows the trapezium with $x = 4$ and $y = 4$.

Find the number of unit triangles in this trapezium.



..... [1]

(b) Complete the table.
You may use results from **Questions 5(b)** and **6(a)**, and patterns to help you.

Shorter parallel side length (x)	Number of unit triangles
1	$3 = 3 \times$ ..... $= 3 \times 1^2$
2	..... $= 3 \times 4 = 3 \times 2^2$
3	..... $= 3 \times$ ..... $= 3 \times$ .....
4	..... $= 3 \times$ ..... $= 3 \times$ .....

[2]

(c) Write down an expression, in terms of x, for the number of unit triangles.

..... [1]

(d) In a trapezium the shorter parallel side length is equal to the sloping side length.
There are 675 unit triangles in this trapezium.

Find the perimeter of this trapezium.

..... [4]

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