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CAMBRIDGE INTERNATIONAL MATHEMATICS

0607/52

Paper 5 Investigation (Core)

February/March 2026

1 hour 15 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. Do **not** use correction fluid or tape.
- 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.

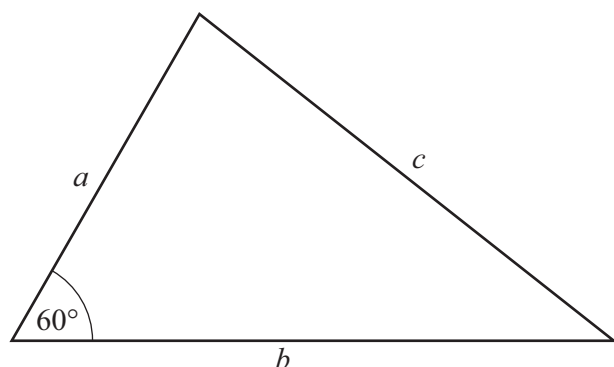
INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [].

This document has 8 pages.

Investigation Eisenstein triples

In this investigation you will look at the lengths of the sides of a triangle where one angle is 60° .

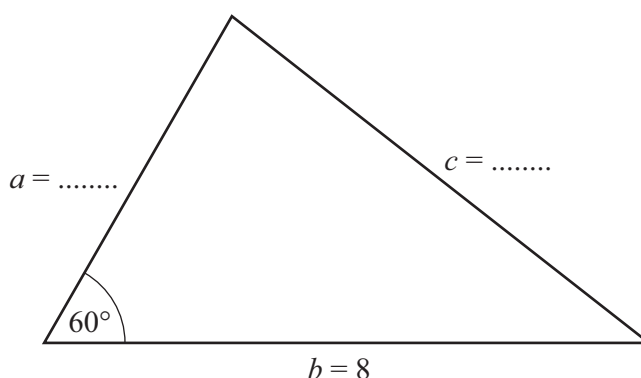


In the triangle:

- the length of the shortest side is a centimetres
- the length of the longest side is b centimetres
- the length of the side opposite the 60° angle is c centimetres.

When a , b and c are integers the sides of the triangle make an Eisenstein triple (a, b, c) .

1 The sides of this triangle make an Eisenstein triple.



(a) By measuring, complete the number of centimetres in the length of each side. [2]

(b) Calculate the squares of your answers to **1(a)**.

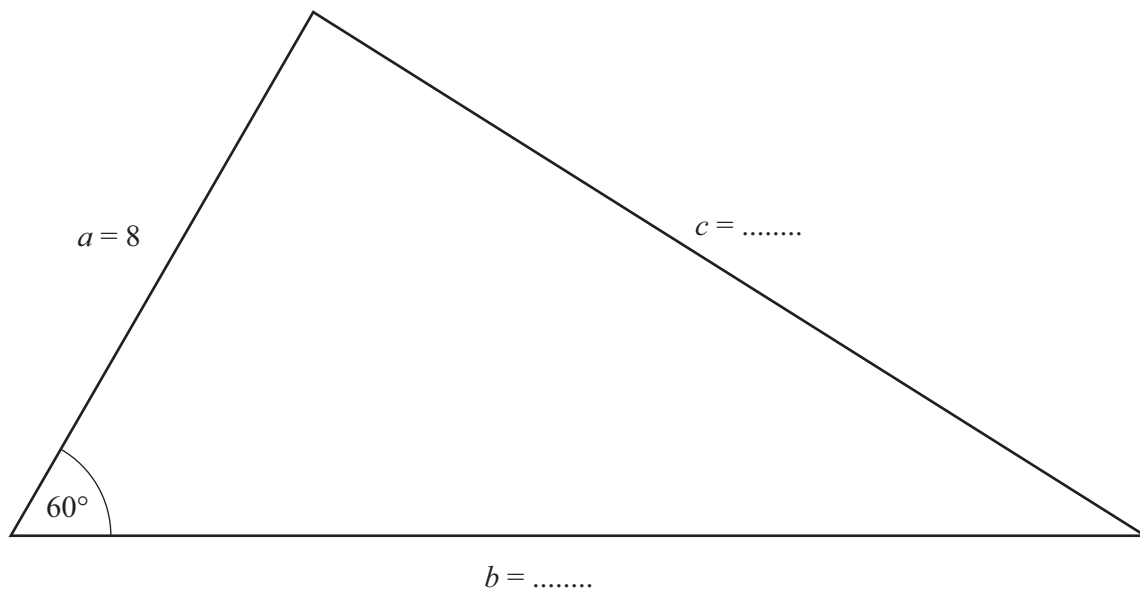
$$a^2 = \dots\dots\dots = \dots\dots\dots \quad b^2 = 8^2 = 64 \quad c^2 = \dots\dots\dots = \dots\dots\dots \quad [2]$$

(c) Use **1(b)** to show that $a^2 + b^2 - c^2 = 40$.

[1]



- 2 The sides of this triangle also make an Eisenstein triple.



- (a) By measuring, complete the number of centimetres in the length of each side. [2]

- (b) Calculate the squares of your answers to 2(a).

$$a^2 = 8^2 = 64 \quad b^2 = \dots\dots\dots = \dots\dots\dots \quad c^2 = \dots\dots\dots = \dots\dots\dots \quad [2]$$

- (c) Use 2(b) to show that $a^2 + b^2 - c^2 = 120$.

[1]



3 Complete the table for Eisenstein triples (a, b, c) .

	a	b	c	a^2	b^2	c^2	$a^2 + b^2 - c^2$	$a \times b$
Question 1		8			64		40	
Question 2	8			64			120	
	5	21	19	25	441		105	
	6		14		256		96	96
	9	24	21			441		216
		35	31			961	385	385

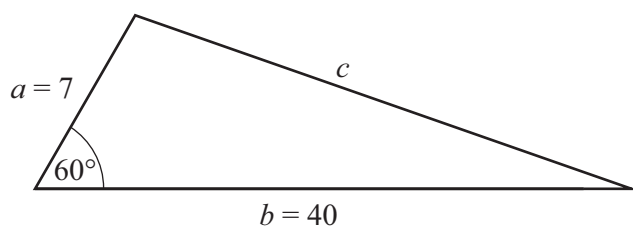
[5]



- 4 (a) Use the headings of the last two columns of the table in **Question 3** to show that $c^2 = a^2 + b^2 - ab$.

[1]

- (b) Use $c^2 = a^2 + b^2 - ab$ to complete the Eisenstein triple for this triangle.



NOT TO SCALE

(7, 40,) [3]

- (c) Show that $c^2 = a^2 + b^2 - ab$ is true for every **equilateral** triangle.

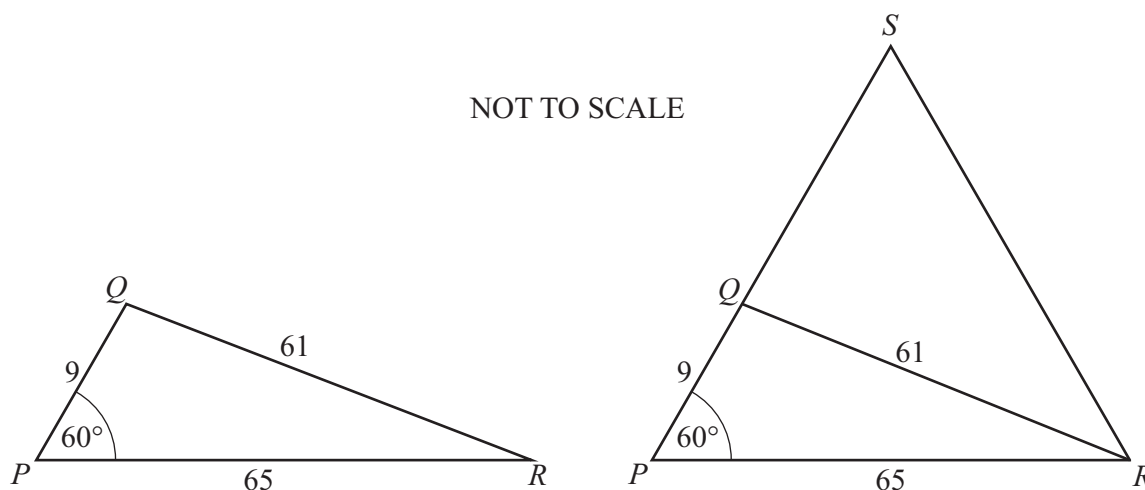
[2]

- 5 (a) Show that $(9, 65, 61)$ is an Eisenstein triple.

[3]

- (b) The diagrams show how you can use one Eisenstein triple to find another Eisenstein triple.

The sides of triangle PQR make the Eisenstein triple $(9, 65, 61)$.



In the diagram on the right, PQ has been extended to S so that $PS = PR$.

- (i) Give geometrical reasons why angle $PSR = 60^\circ$.

.....
 [2]

- (ii) Use triangle QSR to find another Eisenstein triple.

(.....,, 61) [2]



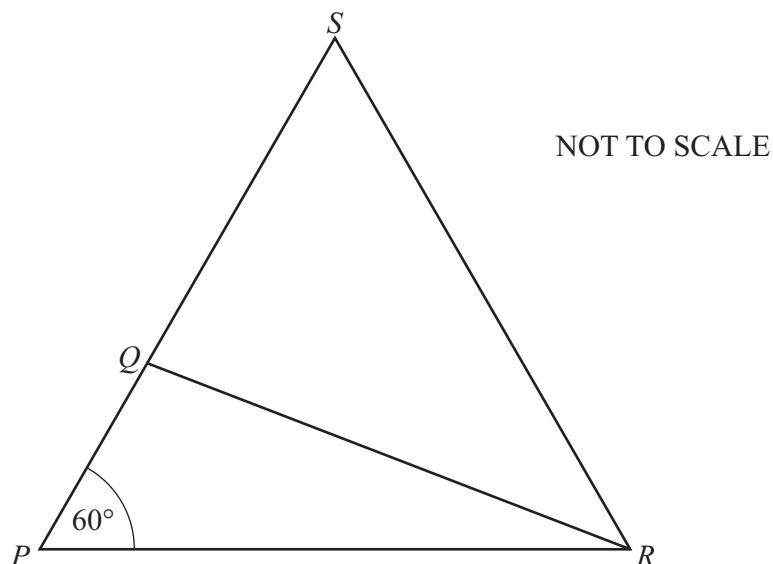
- (c) The two Eisenstein triples in **5(b)** are related to each other by the diagrams.

The Eisenstein triples $(7, 40, 37)$

and $(33, 40, 37)$ are also related to each other in the same way.

Find the Eisenstein triple that is related to $(9, 24, 21)$.

You may use the diagram to help you.



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

Question 6 is on the back page.



6 The table shows a sequence of Eisenstein triples (a, b, c) and the value of $2 \times \sqrt{b+1}$.

(a) Continue the sequence and complete the last 4 rows of the table.

a	b	c	$2 \times \sqrt{b+1}$	answer
5	8	7	$2 \times \sqrt{8+1} = 2 \times 3 = 6$	
7	15	13	$2 \times \sqrt{15+1} = 2 \times 4 = 8$	
9	24	21		
11	35	31		

[5]

(b) Write down the connection between a and $2 \times \sqrt{b+1}$.

..... [1]

(c) Find **two** Eisenstein triples with $b = 899$.

(....., 899,)

(....., 899,)

[5]

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