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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.

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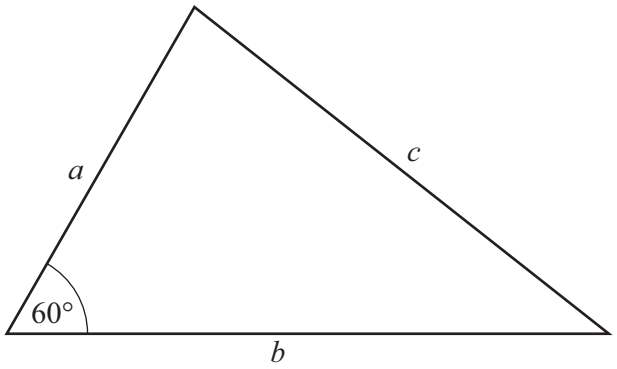
Investigation Eisenstein triples

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

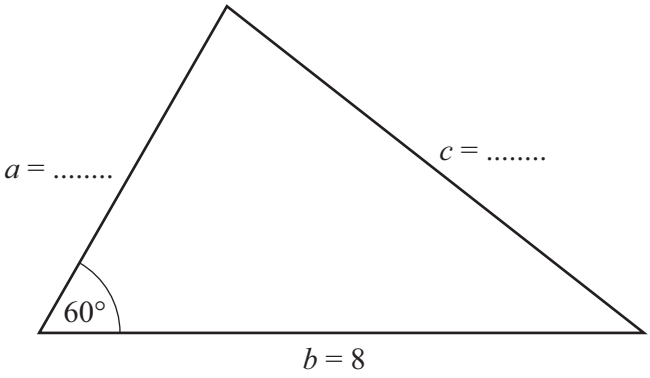


In the triangle:

- 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)**.

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

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

[1]

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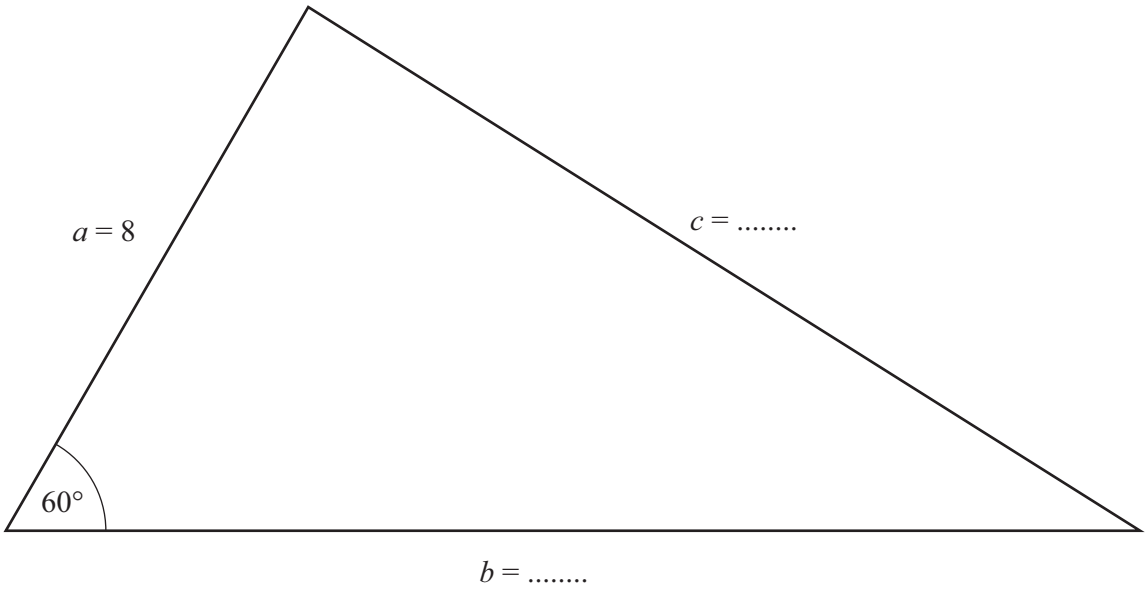
2 The sides of this triangle also make an Eisenstein triple.



(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)**.

$a^2 = 8^2 = 64$ $b^2 =$ ..... $=$ ..... $c^2 =$ ..... $=$ ..... [2]

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

[1]

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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]

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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.

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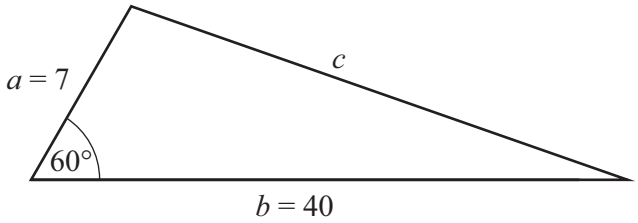

(7, 40, ...) [3]

(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 $(9, 65, 61)$.

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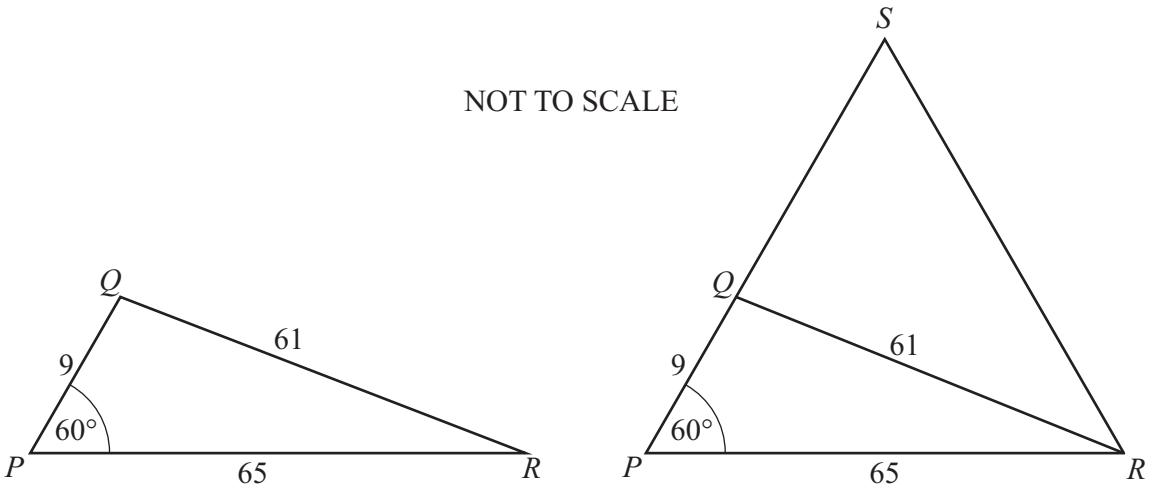

In the diagram on the right, PQ has been extended to S so that $PS = PR$.

(i) Give geometrical reasons why angle $PSR = 60°$.

.....

..... [2]

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

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

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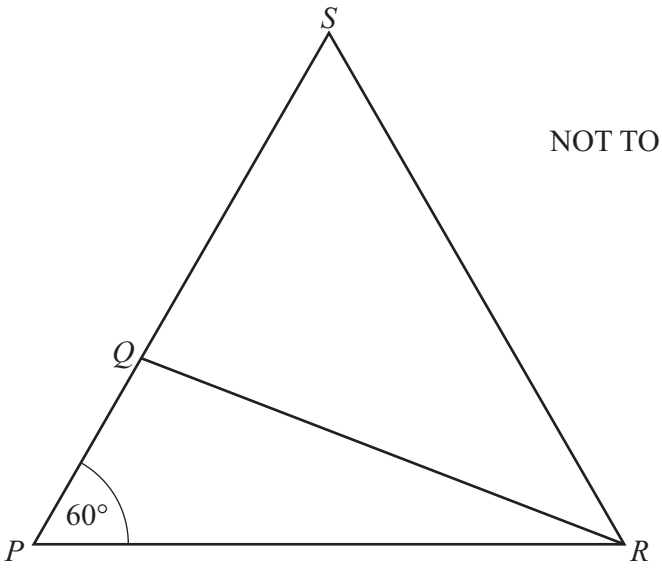
(c) The two Eisenstein triples in **5(b)** are related to each other by the diagrams.

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.



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

Question 6 is on the back page.

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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	$2\times\sqrt{8+1} = 2\times3 = 6$
7	15	13	$2\times\sqrt{15+1} = 2\times4 = 8$
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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