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Cambridge Assessment International Education

# Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*5610044243*

**CAMBRIDGE INTERNATIONAL MATHEMATICS** **0607/53**

Paper 5 Investigation (Core) **October/November 2024**

**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.

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**[Turn over**

Answer **all** the questions.

**INVESTIGATION** **REVERSE DIFFERENCES**

This investigation looks at what happens when you reverse the digits of a number and then find the difference between the new number and the original number. This is called the *reverse difference*.

**STEP 1** Write down a 2-digit number.
**STEP 2** Reverse the digits of the number.
**STEP 3** Find the **positive** difference between the two numbers.

| Example 1 | | | Example 2 | |
|---|---|---|---|---|
| STEP 1 | Write a number | 52 | STEP 1 | 13 |
| STEP 2 | Reverse the digits | 25 | STEP 2 | 31 |
| STEP 3 | Find the difference | $52 - 25 = 27$ | STEP 3 | $31 - 13 = 18$ |

**1** **(a)** Complete the three steps for each 2-digit number in the table.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| STEP 1 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| STEP 2 | 21 | 31 | 41 | 51 | | | |
| STEP 3 | | 18 | | | 45 | | 63 |

[3]

**(b)** Complete this table of 2-digit numbers and their reverse differences.
Use **part (a)** and any patterns you notice to help you.

| Number | Reverse difference | Number | Reverse difference | Number | Reverse difference | Number | Reverse difference |
|---|---|---|---|---|---|---|---|
| 10 | 9 | 20 | 18 | 30 | 27 | 40 | 36 |
| 11 | | 21 | 9 | 31 | 18 | 41 | 27 |
| 12 | | 22 | | 32 | 9 | 42 | |
| 13 | 18 | 23 | 9 | 33 | | 43 | |
| 14 | | 24 | | 34 | | 44 | |
| 15 | | 25 | 27 | 35 | | 45 | |
| 16 | 45 | 26 | 36 | 36 | | 46 | |
| 17 | | 27 | 45 | 37 | 36 | 47 | |
| 18 | 63 | 28 | 54 | 38 | 45 | 48 | |
| 19 | | 29 | 63 | 39 | 54 | 49 | 45 |

[4]

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**(c)** Find how many 2-digit numbers have a reverse difference of 0.

..... [2]

**(d) (i)** Complete the statement with the largest number possible.

The reverse difference is always a multiple of ..... [1]

**(ii)** The table in **part (b)** is extended to the right.
These two columns are part of the extended table.

| Number | Reverse difference |
|---|---|
| *A* | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | 9 |

What is the value of the 2-digit number *A*?

..... [2]

**(iii)** 64 has a reverse difference of 18.

Show how you can use 6 and 4 to work out the reverse difference without using the STEPs.

[1]

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**2** You can find reverse differences for 3-digit numbers using the same steps.

Example

| | | |
|---|---|---|
| STEP 1 | Write a number | 138 |
| STEP 2 | Reverse the digits | 831 |
| STEP 3 | Find the difference | $831 - 138 = 693$ |

**(a)** Complete this table.
You may use any patterns you notice to help you.

| Number | Reverse difference | Number | Reverse difference | Number | Reverse difference | Number | Reverse difference |
|---|---|---|---|---|---|---|---|
| 100 | 99 | 110 | | 120 | | 130 | 99 |
| 101 | 0 | 111 | 0 | 121 | 0 | 131 | 0 |
| 102 | | 112 | | 122 | | 132 | 99 |
| 103 | 198 | 113 | | 123 | | 133 | |
| 104 | 297 | 114 | | 124 | | 134 | |
| 105 | 396 | 115 | | 125 | | 135 | |
| 106 | | 116 | | 126 | | 136 | 495 |
| 107 | | 117 | | 127 | | 137 | 594 |
| 108 | 693 | 118 | | 128 | | 138 | 693 |
| 109 | 792 | 119 | | 129 | | 139 | 792 |

[3]

**(b)** Complete the statement with the largest number possible.

The reverse difference is always a multiple of ..... [1]

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**(c)** A 3-digit number $abc$ has first digit $a$, second digit $b$ and third digit $c$.
In this part $a > c$.

So the number 601 has $a = 6$, $b = 0$ and $c = 1$.

**(i)** There is a relationship between $a - c$ and the reverse difference.

Investigate this relationship, giving three examples.
Write down this relationship.

..... [3]

**(ii)** Anna says that $a$ is the hundreds digit, $b$ is the tens digit and $c$ is the units digit.
She says the value of $abc$ is $100a + 10b + c$.

Anna writes the value of the reverse number $cba$. $100c + 10b + a$

She writes the difference between the two numbers. $(100a + 10b + c) - (100c + 10b + a)$

Continue Anna's working to show that the
reverse difference is $99(a - c)$.

[2]

**(iii)** A 3-digit number has $a = 8$ and a reverse difference of 594.

Find **three** possible 3-digit numbers.

..... [2]

**3** Anna's working in **Question 2(c)(ii)** is for the 3-digit number $abc$.
Anna uses similar working for the 2-digit number $ab$ where $a > b$.

Use Anna's working to show that your answer to **Question 1(d)(i)** is correct.

[5]

**4** A 4-digit number $abcd$, where $a > d$, has a value of $1000a + 100b + 10c + d$.

**(a)** Find an expression, in terms of $a$, $b$, $c$ and $d$, for the reverse difference.
Your answer should have four terms.

..... [3]

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**(b)** A 4-digit number has first digit 7 and last digit 5.
Its reverse difference is 2178.

Find the connection between the middle two digits of the 4-digit number.

..... [4]

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