



## Cambridge IGCSE™

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CAMBRIDGE INTERNATIONAL MATHEMATICS

0607/52

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.

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

STEP 1 Write a number 52  
STEP 2 Reverse the digits 25  
STEP 3 Find the difference  $52 - 25 = 27$

### Example 2

STEP 1 13  
STEP 2 31  
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]





(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]





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]





- (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]





- (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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