

# Algorithmic thinking resources

## Year 3: Number code investigation

8	9	6	7	8	3	4	7	1	7
6	2	9	5	0	2	5	8	3	8
3	8	5	9	1	8	4	9	2	7
2	7	4	8	9	4	9	4	5	7
1	4	4	7	8	0	4	6	7	9
4	6	8	3	9	5	1	8	4	7
3	3	8	3	8	5	9	2	8	9
3	6	9	5	7	4	8	5	8	5
4	5	6	3	7	8	7	8	9	0

**In this lesson students explore the idea of functions and inverse functions to decode simple algorithms.**

*Level 3 - Number and Algebra | Patterns and Algebra | Describe, continue and create number patterns resulting from performing addition or subtraction (VCMNA138)*  
*Level 3 - Number and Algebra | Patterns and Algebra | Use a function machine and the inverse machine to apply mathematical rules to numbers and shapes (VCMA139)*

### MATHEMATICAL LANGUAGE

Row, column, function, decode, rule, double, addition, subtraction, multiplication, division.

### MATERIALS

- A class display of randomly ordered numbers in rows and columns (see pictured and Student Resource Number Code)
- A pointer (e.g., a 30cm ruler).

### WARM UP - INTRODUCING NUMBER CHANT

- Use the Student Resource Number Code, displayed on an interactive white board or digital projector.
- Arrange the class in a semi-circle around the set of numbers so that all students can see the array of numbers and each other.
- Explain to the class that we are going to read out some of the numbers as a group. *Before beginning, make sure the students know how to identify rows and columns.* To help keep time, explain that you will be clicking your fingers. Keeping a slow time to begin with, read any row of numbers in a column or row. For example, the third column reads like this: 6, 9, 5, 4, 4, 8, 8, 9, 6. You may like to model this first and then repeat it with the class.
- Practice this process, reading from different rows and columns.

## LAUNCH

- Once the students are familiar with the resource, tell them that you are going to use the numbers in the top row to make a new sequence of numbers: 9, 10, 7, 8, 9, 4, 5, 8, 2, 8.
- Ask, what have I done to the numbers to create this sequence?
- To help students pick up on the pattern you might: repeat the sequence verbally; point to the numbers and say the sequence; or demonstrate the rule with a second row of numbers.
- Students will identify that you have added 1 to each number to make a new sequence.
- Use the same rule with another row or column of numbers, but this time, don't tell the students which set you are using.
- Explain to the students that they are going to create a set of codes for another student to find within the sequence.

## EXPLORE

Ask students to write six different sequences (codes) from the following 9 options:

Multiplying by 2
Dividing by 2
Multiplying by 3
Multiplying by 5
Adding a number (e.g. 3 more)
Multiplying by 4
Multiplying by 5
Subtracting a number (e.g. 4 less)
Dividing by 10

A student sequence that divides the last row by 2 would be: 2, 2.5, 3, 1.5, 3.5, 4, 3.5, 4, 4.5, 0

A student sequence that multiplies the second last column by 3 would be: 3, 9, 6, 15, 21, 12, 24, 24, 27.

- Once students have written their 6 codes, have them pair up with a like ability student to see which of the other student's sequences they are able to decode.
- Ask the students to think about how they are going to record their responses.
- Monitor the different strategies students are using to decode the sequences. Which students do you

want to get to share their strategies and methods for recording in the lesson summary?

## ENABLING PROMPTS

- Reduce the number of columns and rows.
- Reduce the range of numbers from 1 to 5.
- Add the following cells to the range of options provided for your students:

1 more or 1 less than the number
Describe the sequence using off
Find its friend to make 10

## EXTENDING PROMPTS

- Ask students to work with multistep problems (e.g., create a code that involves adding 3 and then multiplying by 5).
- Add the following cells to the range of options provided for your students:

Addition, subtraction or multiplication of two or more adjacent columns/rows
A quarter, third or fifth of a row or column
Perform two or more functions to a single row or column (e.g., $\times 3$ , $\times 4$ )

## SUMMARISE

- In the summary, invite students to share the strategies they used to decode their partner's sequences.
- Spend some time collaboratively trying to decode some of the yet to be found sequences.

## EXTENDED VICTORIAN CURRICULUM LINKS MATHEMATICS

### Level 3 - Number and Algebra

#### Number and Place Value

- Investigate the conditions required for a number to be odd or even and identify odd and even numbers (VCMNA129)
- Recognise and explain the connection between addition and subtraction (VCMNA132)
- Recall addition facts for single-digit numbers and related subtraction facts to develop increasingly efficient mental strategies for computation. (VCMNA132)
- Recall multiplication facts of two, three, five and ten and related division facts (VCMNA134)

## **Patterns and Algebra**

- Describe, continue and create number patterns resulting from performing addition or subtraction (VCMNA138)
- Use a function machine and the inverse machine to apply mathematical rules to numbers and shapes (VCMA139)

## **Level 3-4 - Critical and Creative Thinking**

### **Questions and possibilities**

- Construct and use open and closed questions for different purposes. (VCCCTQ010)

### **Reasoning**

- Identify and use 'if, then...' and 'what if...' reasoning (VCCCTR016)

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3	6	9	5	7	4	8	5	8	5
4	5	6	3	7	8	7	8	9	0