Lab 2– Hosoya’s Triangle

CMPUT 229

Background

Hosoya’s Triangle

- Introduced and Named after **Haruo Hosoya**, emeritus Professor of Chemistry at Ochanomizu University, Tokyo, Japan
- Also called Fibonacci Triangle
- Relates to topology of Organic Chemistry

Fibonacci Sequence

$$0 \quad 1 \quad 1 \quad 2 \quad 3 \quad 5 \quad 8 \quad 13$$

Fibonacci Sequence

$$0 \quad 1 \quad 1$$

Fibonacci Sequence

$$0+1=1$$

Fibonacci Sequence

$$0 \quad 1+1=2$$

Fibonacci Sequence

$$0 \quad 1 \quad 1+2=3$$

Fibonacci Sequence

$$0 \quad 1 \quad 1 \quad 2+3=5$$

Fibonacci Sequence

$$0 \quad 1 \quad 1 \quad 2 \quad 3 + 5 = 8$$

Fibonacci Sequence

$$0\ \ 1\ \ 1\ \ 2\ \ 3\ \ 5+8=13$$

Fibonacci Sequence

$$0 \quad 1 \quad 1 \quad 2 \quad 3 \quad 5 \quad 8 \quad 13$$

How to Calculate Fibonacci Sequence

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```
F[0] = 0
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Initial Conditions

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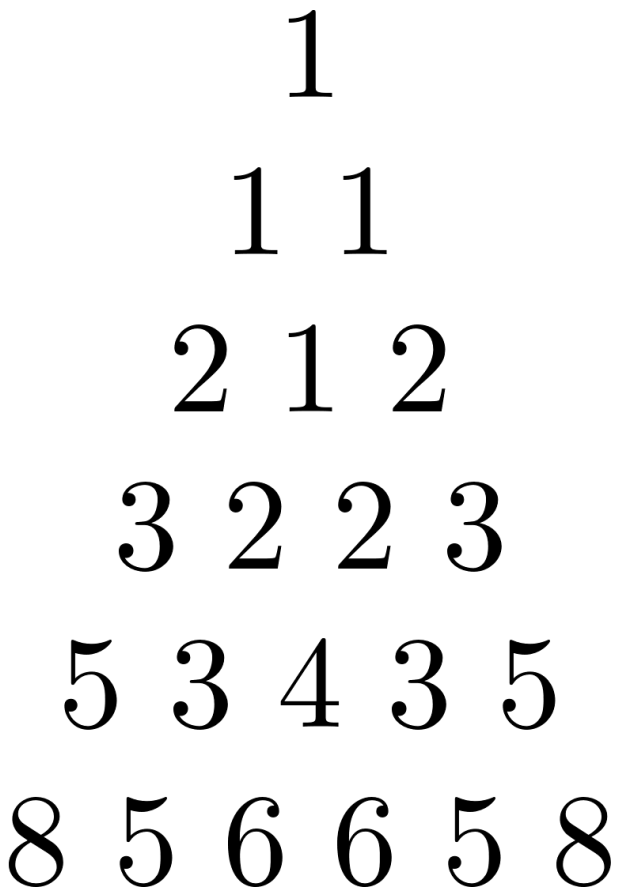
$$0 \quad 1 \quad 1 \quad 2 \quad 3 \quad 5 \quad 8 \quad 13 \quad 21$$

Triangle Structure

Best Introduced by image



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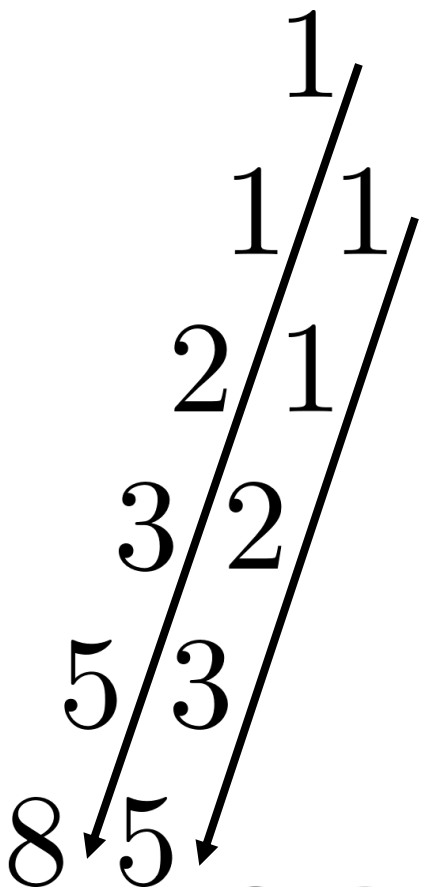

Diagonals are the Fibonacci Sequence

(excluding the first 0)

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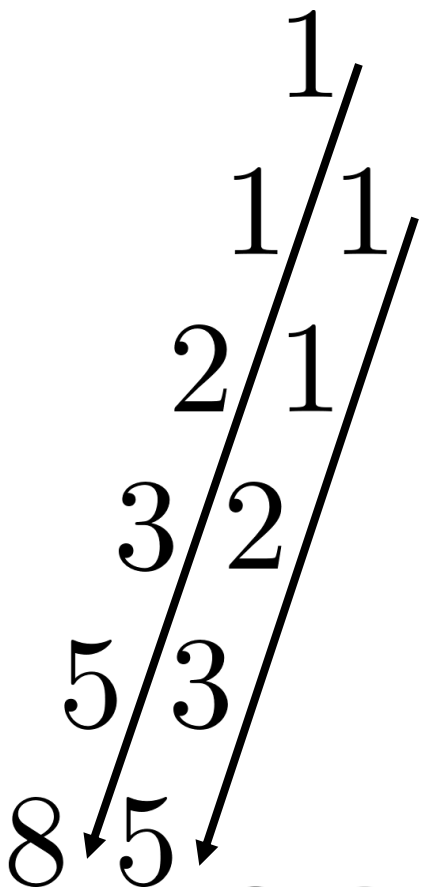

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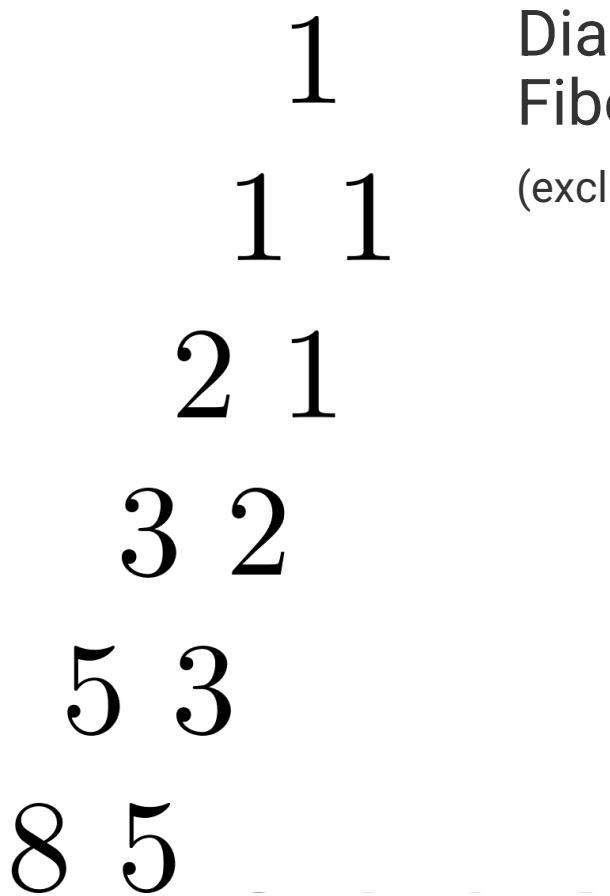

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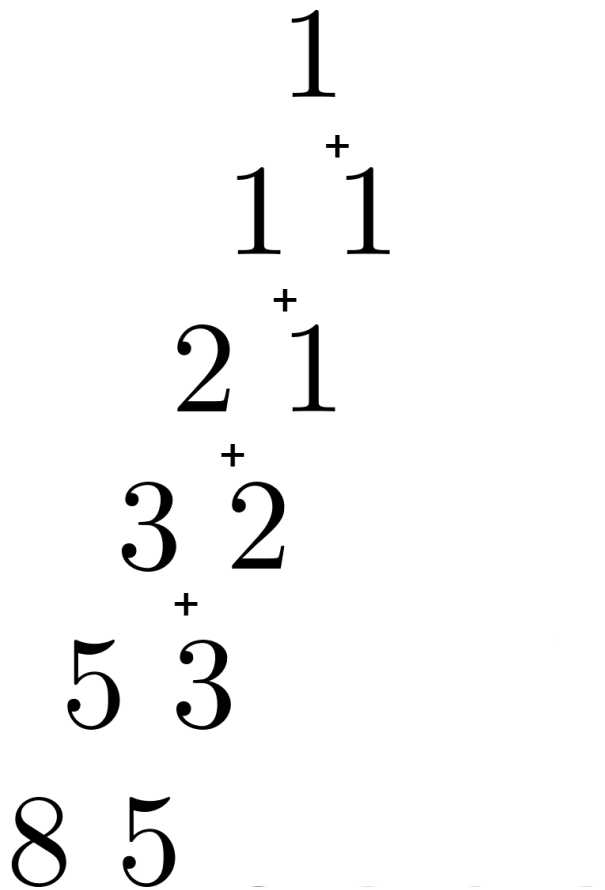

To get the next diagonal,
add up elements of last 2

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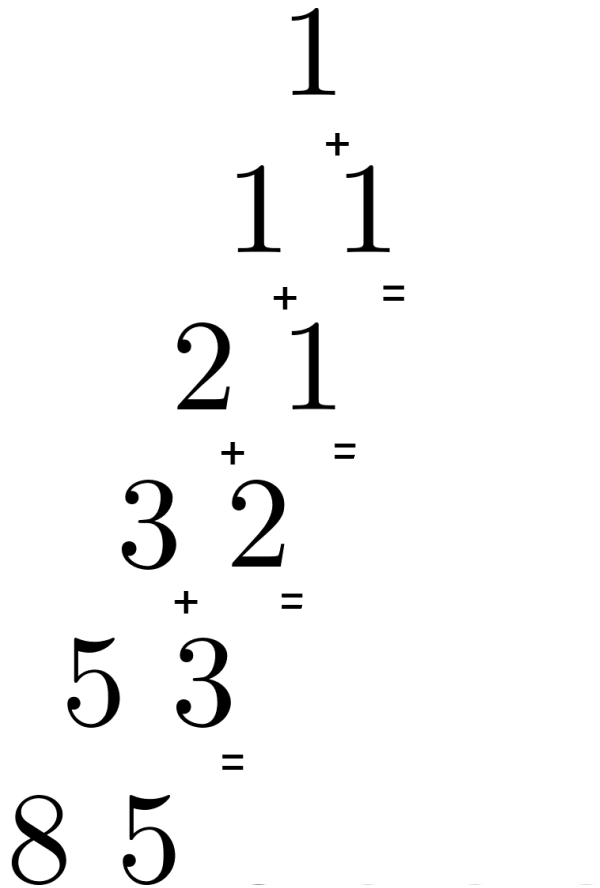

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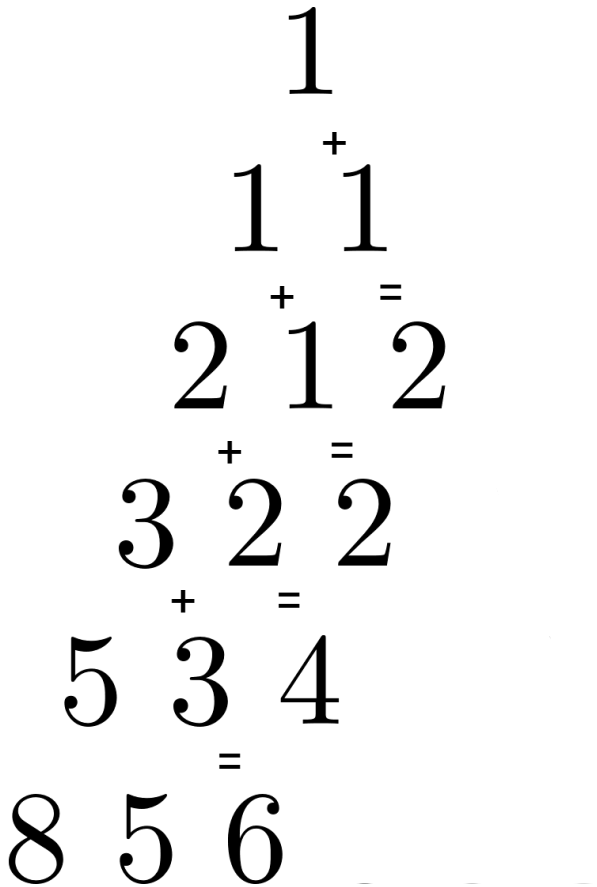

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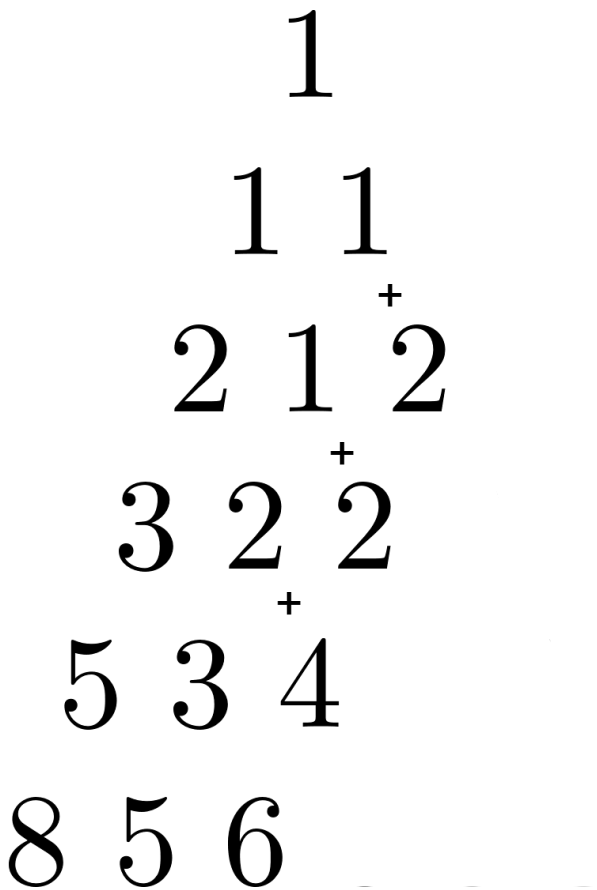

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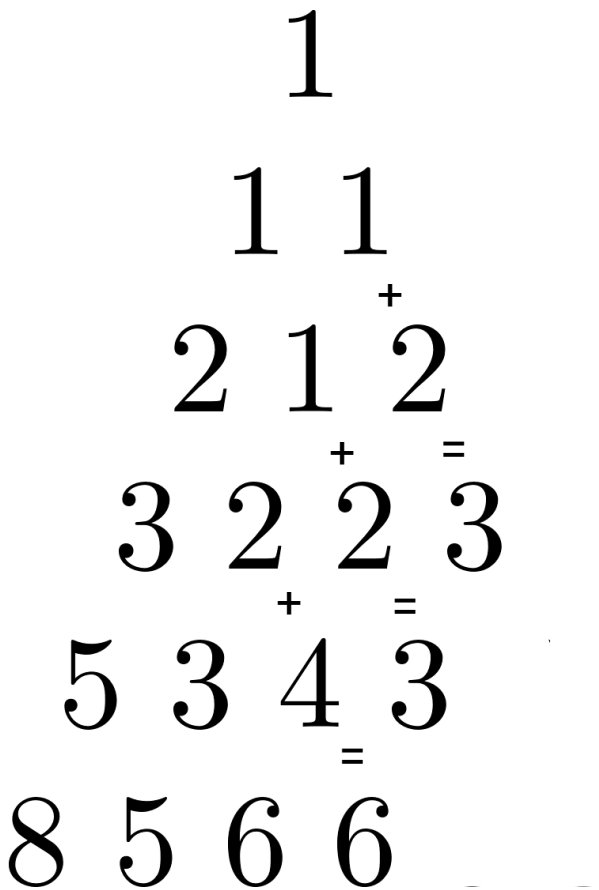

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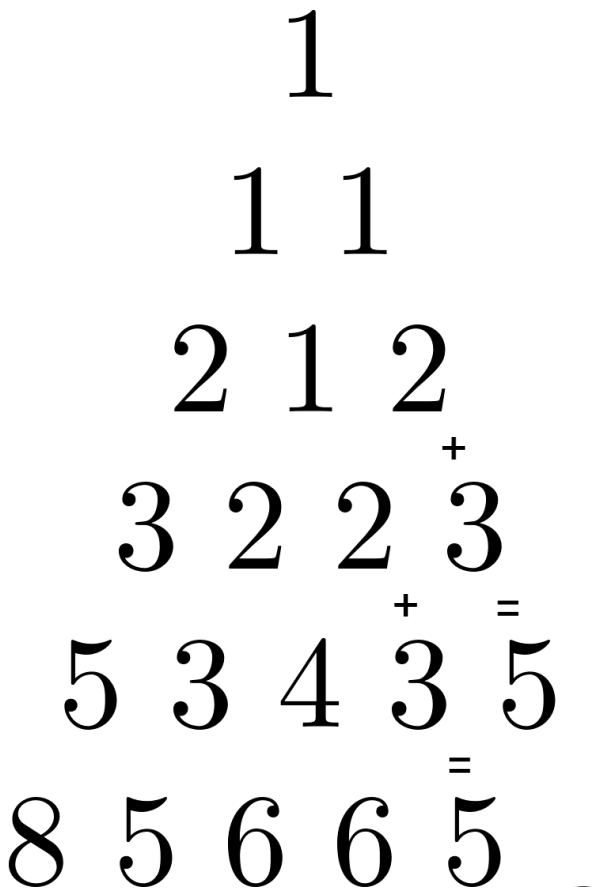

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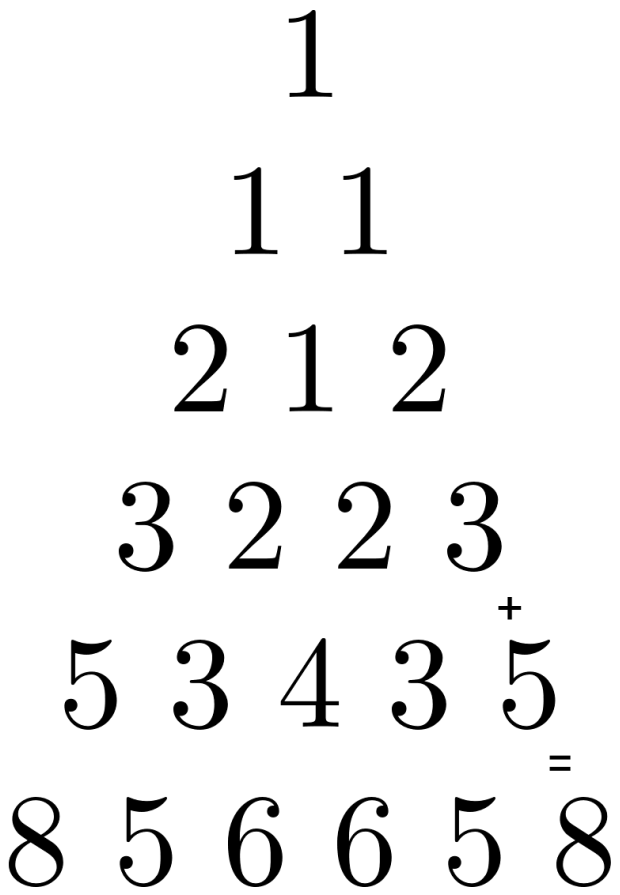

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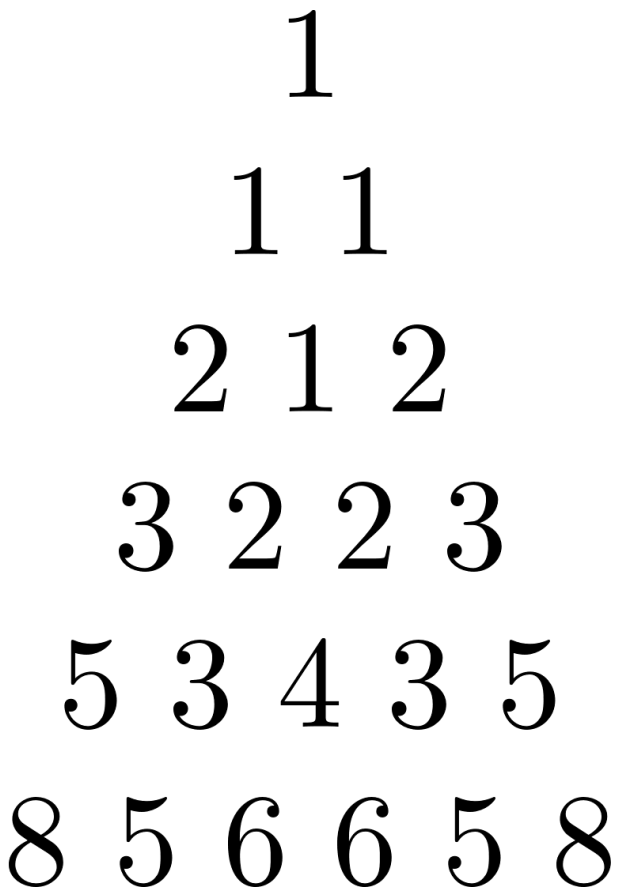

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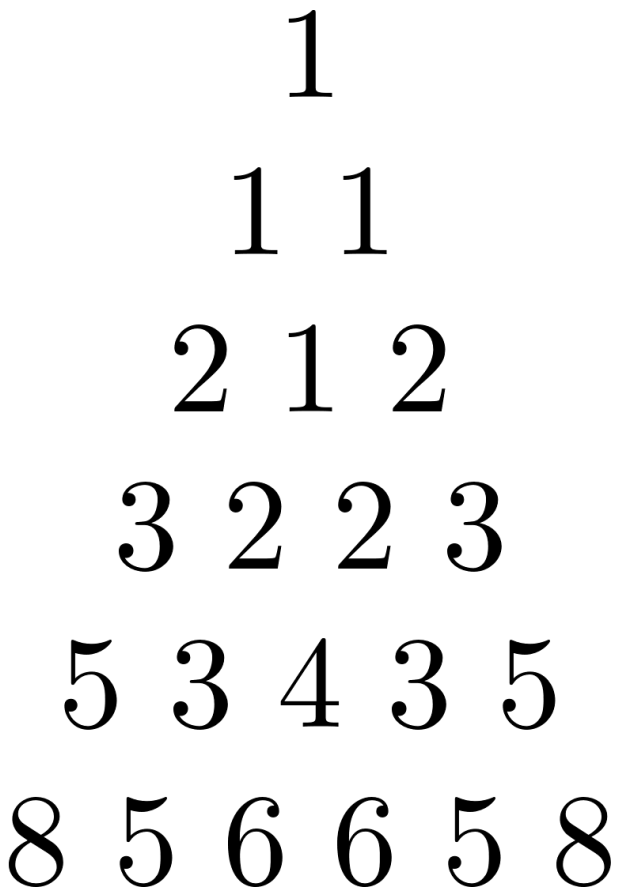

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H[0] = 1

H[1] = 1 1

H[2] = 2 1 2

H[3] = 3 2 2 3

H[4] = 5 3 4 3 5

H[5] = 8 5 6 6 5 8

H[n] is the (n+1)-th level

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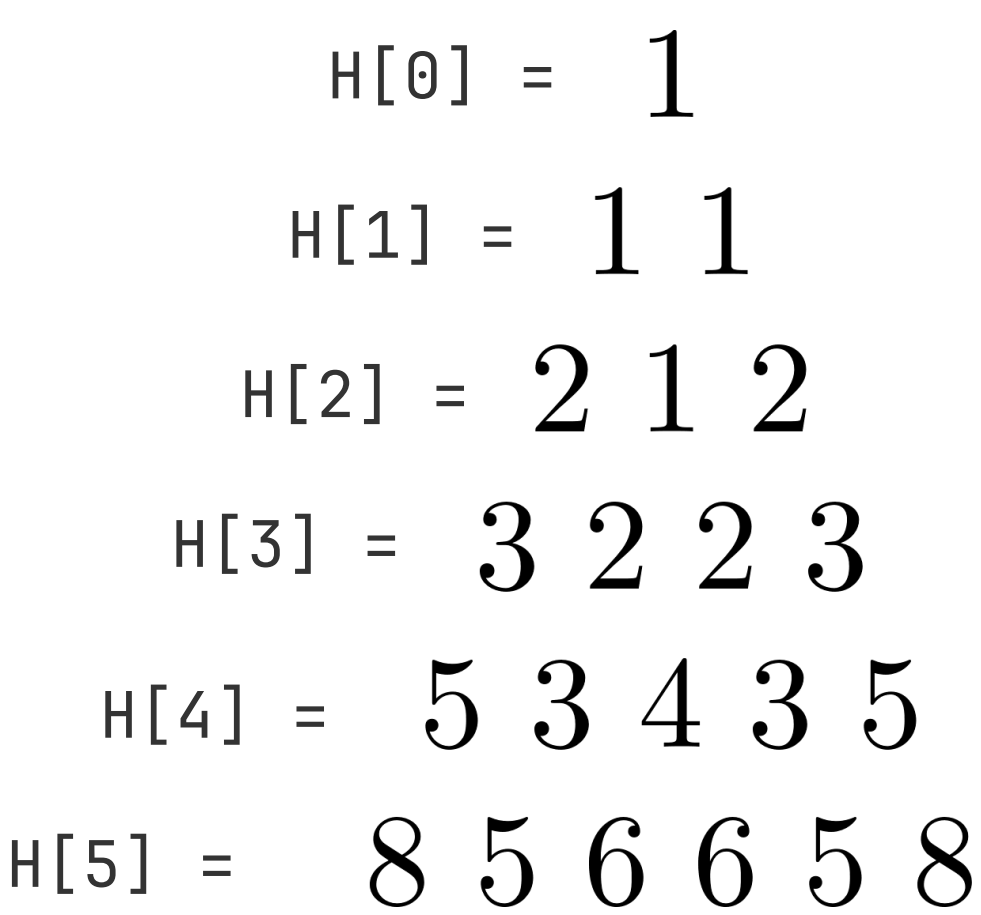

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To calculate H[n][k],

H[n][k] = F[k+1]*F[n-k+1]

Assignment

hosoyaTriangle

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Description: Writes N-th level of Hosoya's Triangle in array provided in a2

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Arguments:

a0: N

a1: Pointer to empty array used for storing Fibonacci Sequence

a2: Pointer to empty array used for storing N-th level of Hosoya's Triangle

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Description: Writes N-th level of Hosoya's Triangle in array provided in a2

Arguments:

a0: N

a1: Pointer to empty array used for storing Fibonacci Sequence

a2: Pointer to empty array used for storing N-th level of Hosoya's Triangle

Side Effect:

Array provided in a2 contains the N-th level of Hosoya's Triangle

Testing

Testing your solution

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Included Tests:

We have provided some tests in the ‘Tests’ folder. They are not exhaustive however, and you should do further testing of your own solution. ‘*.txt’ files correspond to the inputs, and ‘*.out’ files correspond to the expected outputs.

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Give the file path as a program argument:

You can pass in the path to the test file (RARS may need the whole path) into the program argument section at the top after you assemble your program. (If there is not an input box for it go to Settings -> Program Arguments Provided To Program

Test Case Format

The format is very simple, the input is a text file with a number `N`, the output is an array of numbers separated by spaces

Example File:

2

Example Output:

`2 1 2`

The End