School District: **Teacher's Name:**
Class Grade Level: 7th
Lesson Name: Fibonacci numbers and computers
Lesson: Math and Coding
Accommodations:
Material(s):
Time allotment: 180 minutes

MLS Standards:
Math:

- Understand a ratio as a comparison of two quantities and represent these comparisons.
- Solve problems involving ratios, rates, percentages and proportional relationships.
- Understand the concept of a unit rate associated with a ratio, and describe the meaning of unit rate.

Computer Science:

- 6-8.CS.D.01 Evaluate the design of computing devices, based on the characteristics of each device and how users interact with it, to improve the overall user experience.
- 6-8.DA.VT.01 Collect data using computational tools and display it for the end user in an easy to understand way.

Learning Goal(s):

- Learn the Fibonacci sequence and how we meet it to everyday life
- Introduce students to computing using a programming tool

Objective(s):

- The lesson wants to link unplugged computer science with Scratch. Students will learn the Fibonacci numbers, to convert them to binary numbers used in computer science. Then students will learn to use Fibonacci numbers in everyday life and in nature and make scratch stories using codes with Fibonacci numbers.

Background information and/or Activate Prior Knowledge:

Introduction/Anticipatory Set/Engage:
Read 5 minutes, individually:
Read the problem carefully and try to understand it. The problem is: Suppose a newly-born pair of rabbits, one male, one female, are put in a field. Rabbits are able to mate at the age of one month so that at the end of its second month a female can produce another pair of rabbits. Suppose that our rabbits never die and that the female always produces one new pair (one male, one female) every month from the second month on. How many pairs will there be in one year?

Teaching (I do):

Guided Practice (We do):
Explore:
Collaborate 10 minutes, groups of 4:
Collaborate with your group members in order to find a solution to the above problem. Try to hypothesize and solve it.
Reflect: Discuss 10 minutes, whole class:
With your classmates and your teacher discuss about the sequence of the numbers we have just discovered.
Collaborate 15 minutes, groups of 4:
With your group members try to convert three consecutive numbers of Fibonacci sequence into binary numbers. The teacher can demonstrate an example of a conversion.
Discuss 5 minutes 20 students, whole class:
Discuss the importance of Fibonacci numbers to computer science.
Practice 15 minutes, individually:
At home get the hang of the Fibonacci numbers converting at least 5 consecutive numbers to binary numbers. At home go to this address: https://www.coolmathgames.com/0-2048-fibonacci
and try to learn the sequence of numbers by playing.
Read 15 minutes, individually:
Read the attached resource or got to:
http://www.maths.surrey.ac.uk/hosted-sites/R.Knott/Fibonacci/fibnat.html#petals
See how Fibonacci numbers appeal to nature and everyday life.
Collaborate 10 minutes, groups of 4:
Try to make a code with the Fibonacci sequence in order to make a flower

Group/Independent Practice (You do):
Map:
Produce 10 minutes, groups of 4:
Each group exchange its work and try to decode the code in order to draw the flower.
Practice 20 minutes, pairs of 2:
Listen to your teacher's instruction and make a flower on scratch program using a code based on Fibonacci sequence.
Practice 15 minutes, individually:
At home: Take a look at a cauliflower: First look at it: Count the number of florets in the spirals on your cauliflower. The number in one direction and in the other will be Fibonacci numbers, as we've seen here. Do you get the same numbers as in the picture? Take a closer look at a single floret (break one off near the base of your cauliflower). It is a mini cauliflower with its own little florets all arranged in spirals around a center. If you can, count the spirals in both directions. How many are there? Then, when cutting off the florets, try this: start at the bottom and take off the largest floret, cutting it off parallel to the main "stem". Find the next on up the stem. It'll

be about 0.618 of a turn round (in one direction). Cut it off in the same way. Repeat, as far as you like. Now look at the stem. Where the florets are rather like a pine cone or pineapple. The florets were arranged in spirals up the stem. Counting them again shows the Fibonacci numbers.

Make:

Produce 10 minutes, groups of 4:

Try to produce a problem or a story using Fibonacci numbers based on real life situations. An example is this: You are offered a job, which lasts for 7 weeks. You get to choose your salary. Either, you get $100 for the first day, $200 for the second day, $300 for the third day. Each day you are paid $100 more than the day before. Or, you get 1 cent for the first day, 2 cents for the second day, 4 cents for the third day. Each day you are paid double what you were paid the day before.

Show:

Discuss 10 minutes, whole class:

Discuss with your teacher how easy or difficult it was to create a story or a problem with Fibonacci numbers. Listen to your teacher how to solve the problem by splitting it into smaller problems-pieces.

Investigate 10 minutes, pairs of 2:

Explore again the scratch program with your teacher's help and try to find a way to make your story on stage.

Collaborate 20 minutes, pairs of 2:

Use scratch program to type your instructions to make your story on stage. If it works, try to implement your program giving much scrips.

Read 15 minutes, whole class:

When you will have finished your work, you can show it to your classmates.

Discuss 15 minutes, whole class:

You can discuss about the difficulties to create each story in scratch.

Practice 20 minutes, individually:

At home, you can practice by making a story using Fibonacci numbers in scratch.

Assessment (Formative or Summative)

Questions/questioning strategies:

Notes, Reflections, Attachments

http://www.allyouneediscode.eu/documents/12411/69843/Lesson+plan+5_+Fibonacci+numbers+and+computers.pdf/1b7ddbf7-d1bb-4121-9a6e-5b1b3626e4e3

https://www.ucl.ac.uk/learning-designer/viewer.php?uri=%2Fshared%2Ffid%2Ffddf7565d04bb00eca9bd5fd85f36aa3ab13cd46ed72c75dc48f2620cd5e3b34


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