

1. Let's create some aRt!

- (a) Install the **aRtsy** package. Provide the code in an R chunk that does not run. You only need to install it one time.

Solution:

```
install.packages("aRtsy")
```

- (b) Load the **aRtsy** package. Provide the code in an R chunk that does run. We need to load the library each time it is run.

Solution:

```
library("aRtsy")
```

- (c) Running `demo("aRtsy")` or `vignette("aRtsy")` don't return any helpful demos or tutorials. However, if you run `help("aRtsy")` you will find a link to a tutorial. Recreate the first figure they make using `canvas_collatz()`. Make sure to update the caption.

Solution:

```
set.seed(1)  
canvas_collatz(colors = colorPalette("tuscan3"))
```



Figure 1: Dry Grass

- (d) Change the randomization seed to 1313, which will change the random numbers generated to create the plot. Can you see the difference? Make sure to update the caption.

Solution:

```
set.seed(1313)  
canvas_collatz(colors = colorPalette("tuscan3"))
```



Figure 2: Longer Dry Grass

- (e) Now, create a new Collatz conjecture plot by specifying the following arguments. Note you will find the help file for the `canvas_collatz()` function to be rather helpful. Make sure to update the caption.
- Use the `vrolik4` color palette. Note you can find other by running `?colorPalette` in the console.
 - Make the background grey. Note a hexcode for grey is `#dbdbdb`.
 - Specify that there should be 72 strands.
 - Specify the angle used for bending the sequence for odd numbers as `-0.05`.
 - Specify the angle used for bending the sequence for even numbers as `0.0145` (note this is the default).

Solution:

```
canvas_collatz(
  colors = colorPalette("vrolik4"),
  background = "#dbdbdb",
  n = 72,
  angle.even = 0.0145,
  angle.odd = -0.05
)
```

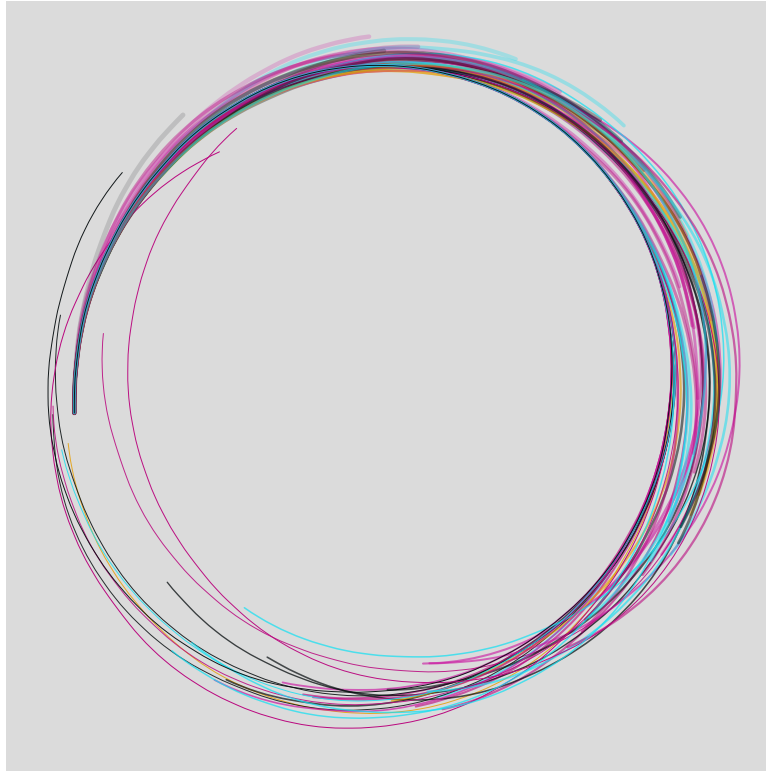


Figure 3: Almost Circle

- (f) Make another plot using the tutorial – feel free to be creative here! Note that I leave creating the R chunk and figure environment to you here. Make sure that your code is well-formatted and your plot is appropriately scaled.

Solution:

```
canvas_collatz(  
  colors = colorPalette("retro4"),  
  background = "#dbfada",  
  n = 37,  
  angle.even = 0.74,  
  angle.odd = -0.075  
)
```



Figure 4: Swirls

- (g) Use `citation()` to get the BiBTeX citation for the `aRtsy` package and use `\citep{}` to add a parenthetical citation to the end of the sentence below.

Solution: We created the generative art in Question 1 using the `aRtsy` package for R (Derks, 2024).

2. Suppose we wanted to solve $2^{x+1} + 2^{x-1} = 40$ for x . While this is a pretty straightforward algebra problem, it's useful for demonstrating the use of objects in R.

- (a) Create a numeric vector containing the integers from 0 to 10 inclusive. Hint – the solution to this problem is one of these values.

Solution:

```
x <- seq(from = 0, to = 10, by = 1)
```

- (b) Complete the algebra to compute $2^{x+1} + 2^{x-1}$ for each value in the numerical vector created in step 1. Make sure to save the result to a new numeric vector.

Solution:

```
#Code run in Question 2 Part A
#x <- seq(from = 0, to = 10, by = 1)

eq <- 2^{x+1}+2^{x-1}
```

- (c) Use the which() function to ask which result is 40.

Solution:

```
#Code run in Question 2 Part A
#x <- seq(from = 0, to = 10, by = 1)

#Code run in Question 2 Part B
#eq <- 2^{x+1}+2^{x-1}

which(eq==40)

## [1] 5
```

- (d) What is the solution? That is, what value of x yields $2^{x+1} + 2^{x-1} = 40$?

Solution: The 5th element in the vector is the solution which means x must equal 4 ($x = 4$) for the equation to equal 40.

- (e) Explain why this approach wouldn't work for something like $3^{x+2} + 5(3^x) = 84$ where the solution is $x \approx 1.6309$.

Solution: As 1.6309 is **NOT** an integer! The method used earlier will fail for this question as 1.6309 is **NOT** a value in the vector.

References

Derks, K. (2024). *aRtsty: Generative Art with 'ggplot2'*. R package version 1.0.0.