

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:

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





Figure 1: A collatz conjecture with a seed of 1

- (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: A collatz conjecture with a seed of 1313

- (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)
```

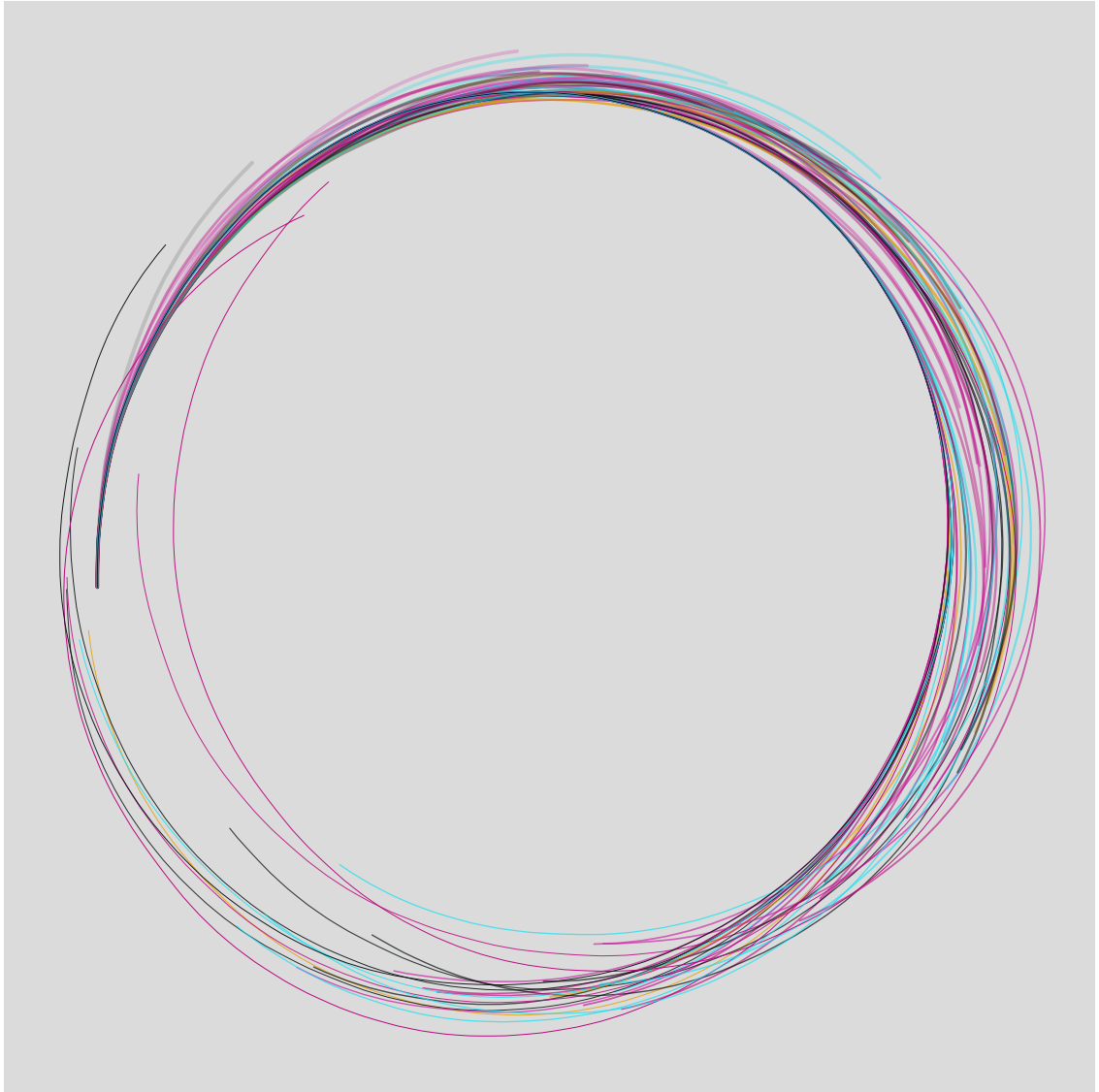




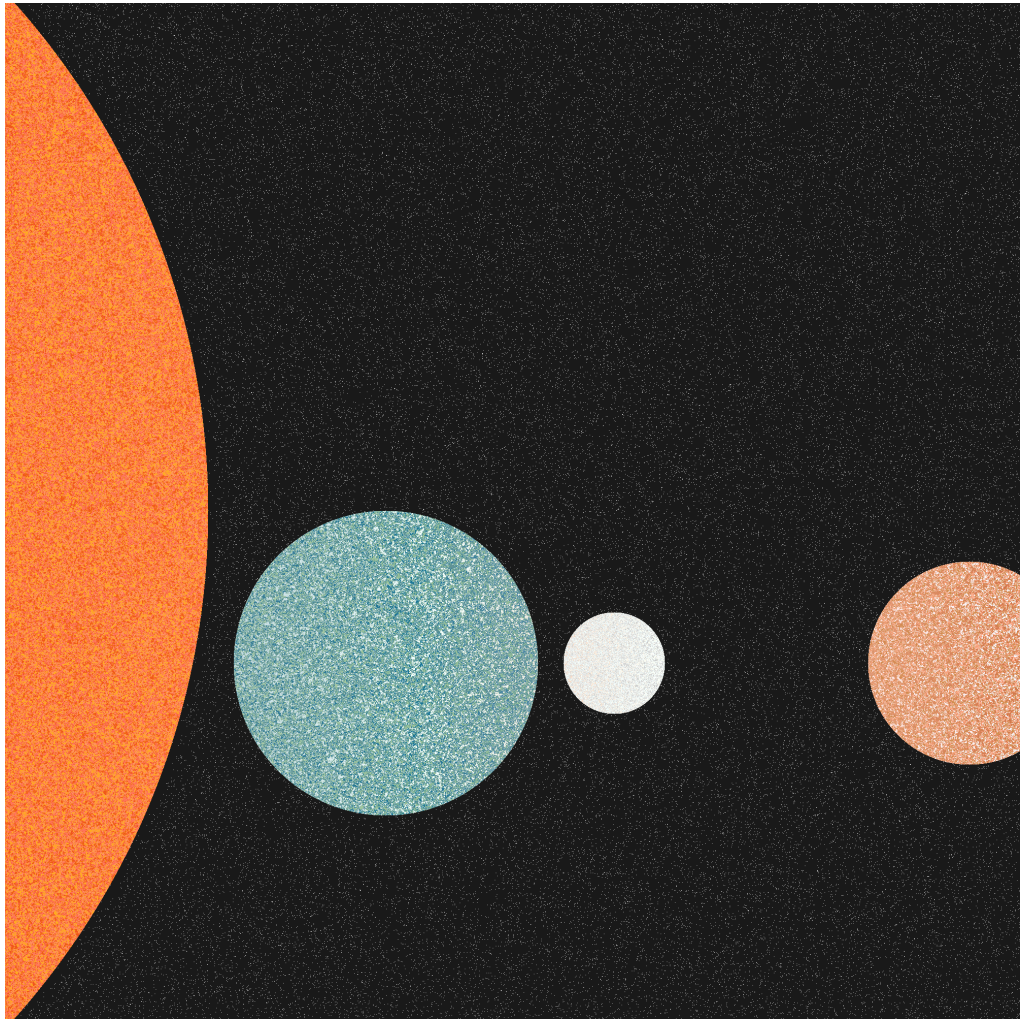
Figure 3: A collatz conjecture with a seed of 1313, 72 strands, and -0.05 angle for bending the odd number sequence.

- (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:

```
set.seed(149)
colors <- list(
  c("darkseagreen", "darkslategray4", "deepskyblue4", "azure"),
  c("sienna3", "peru", "lightsalmon1", "ghostwhite"),
  c("orangered2", "orange", "tomato1", "coral"),
  c("ivory", "azure", "mintcream", "grey", "grey100", "lightgrey")
)

canvas_planet(colors,
  starprob=0.005,
  radius = c(300, 200, 1500, 100),
  center.x= c(750, 1900, -1100, 1200),
  center.y= c(700, 700, 1000, 700),
  light.right = FALSE,
  resolution = 2000
)
```



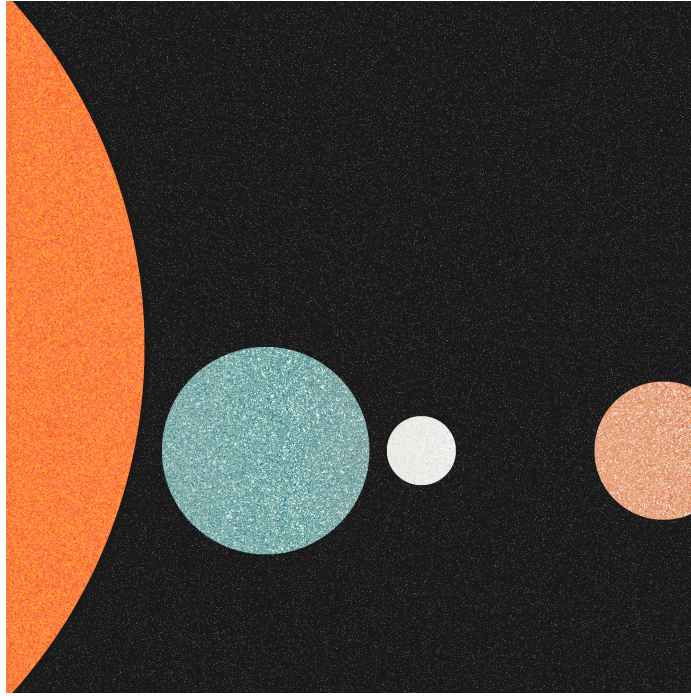


Figure 4: A planet plot of an Earth-like planet, a moon, and a Mars-like planet.

- (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.

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:

- (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:

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

Solution:

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

Solution:

- (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: