

ISFG summer school - virtual edition 2021

Pedigree analysis in R

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Exercise set I. Introduction to pedigrees, genetics and R

Exercise I-1

Draw pedigrees (by hand) showing the following relationships.

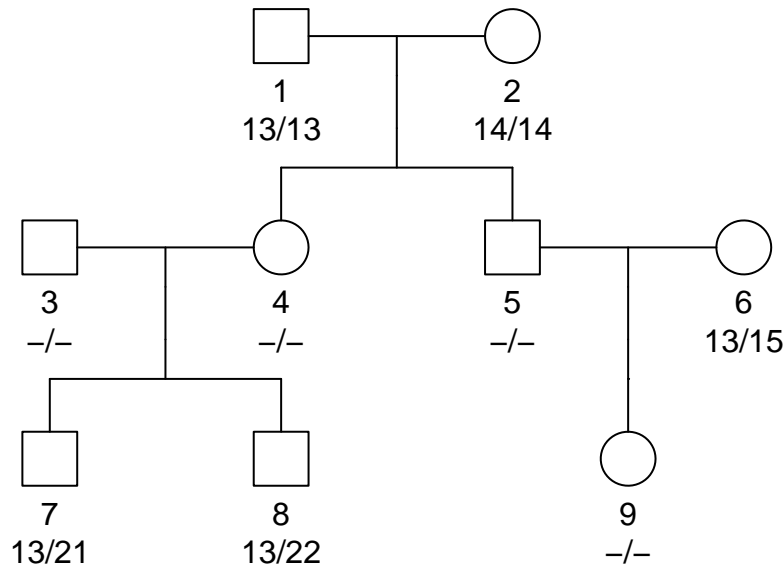
- First cousins twice removed.
- Half second cousins once removed.
- Double second cousins. (Hint: Let the fathers be first cousins, and similarly for the mothers.)

Exercise I-2

- The fathers of Adrian and Belinda are maternal half siblings. Draw the pedigree and describe the relationship between Adrian and Belinda.
- It turns out that Adrian and Belinda have the same mother. Draw the pedigree now and describe the relationship. Is the pedigree inbred?

Exercise I-3

In the pedigree below some members have been typed with a single DNA marker.



- What kind of marker is this: SNP or STR? Autosomal or X-linked? How do you know?
- How many different alleles are observed in the family. What do the allele labels (e.g. 13) mean?
- What are the genotypes of individuals 4 and 5?
- Can you determine the genotype of individual 3?
- What are the possible genotypes for individual 9, and how likely is each of them?

Basic R

If you are an experienced R user, feel free to skip this section.

Exercise I-4

Guess the outcome of the following R commands. Execute the commands to see if you were correct.

a) `2 - 4 / 2 + 3 ^ 2`

b) `1:4 + 1 + c(0, 0, 0, 10)`

c) `sqrt(c(1,4,9,16))`
`10^(1:3)`
`log10(1000)`
`exp(1)`

d) `x = 0`
`y = 1:5`
`z = seq(from = 6, to = 10)`
`c(x, y, z)`

e) `y = list(a = 1:3, b = "foo")`
`y$a = c(y$a, 4:6)`
`y$b = c(y$b, "bar")`
`y$c = c(T, F)`
`y`

Exercise I-5 (Simple R plot)

Use the following code to plot the graph of $y = x^3 - x$ for x between -3 and 3 .

```
x = seq(-3, 3, length = 100)
y = x^3 - x
plot(x, y, type = "l", main = "My graph")
```

Exercise I-6 (Install the pedsuite)

The following command installs the **pedsuite** packages which we will be using throughout the course. The only exercise here is to make sure it works, so that you are prepared for the next session.

```
install.packages("pedsuite")
```

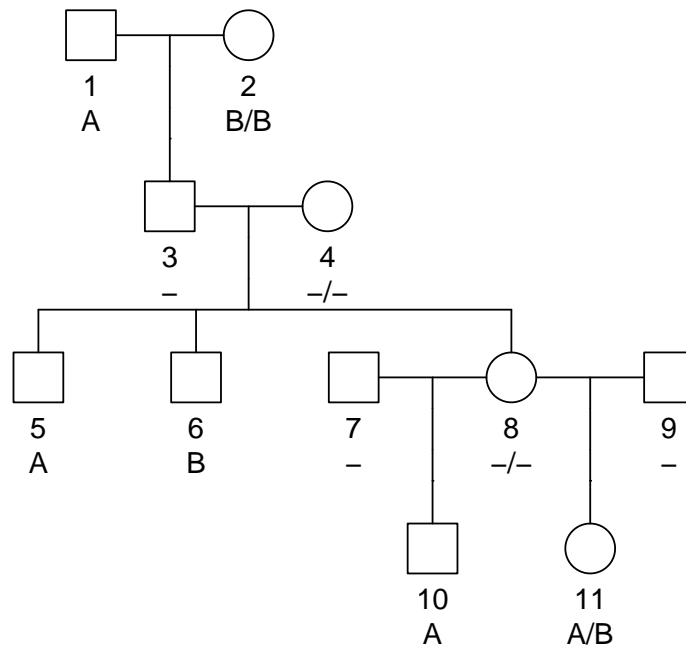
If successful, you should be able to load the packages as follows:

```
library(pedsuite)

# Try plotting a pedigree!
plot(nuclearPed())
```

Exercise I-7 (Bonus exercise if you have time: X-linked inheritance)

In the pedigree below some members have been typed with a X-linked SNP marker.



- What is the genotype of individual 3?
- What is the genotype of individual 4?
- What is the genotype of individual 8? Which allele did she inherit from her mother?
- Can you determine the genotype of individual 7? What about individual 9?
- What is the relationship between 10 and 11? Between 5 and 11? 4 and 9?