Exercise in Genetic Algorithm answers

I Basic level

1. In black we have the mean fitness. In red we have the mean fitness of the top 5 individuals

2. **A.** 50
   B. 8 genes
   C. Only the best can reproduce
   D. List consisting of population size ($size), number of genes ($L), Architecture of the genome of the 50 individuals ($Genes) and the fitness of the 50 individuals ($fitness)
   E. The first loop evaluates each individual among the 50 present and the second loop is used for calculating the fitness of for each individual by assessing its genome
   F. The individuals of the parent population are sorted in decreasing order according to their fitness. The parents at the top (the ones with highest fitness) reproduce and the ones at the bottom (the ones with lowest fitness) are replaced by the new offspring.
   G. Because we want to preserve the best genes, otherwise these ones would be replaced, there would be no selection.

3. Check lecture notes from this morning

II Advanced level

4. Random numbers drawn from a uniform distribution according to a vector length (x) and a range of maximum and minimum values (max =, min =)

5. Use the code given in the pdf and see what happens

III Expert level

For this exercise, run the Ex_iii_GA.R code provided in Canvas.

6. -18.43 (min(z))
   This provides you an idea of what value you can expect to find when running Ex_iii_GA.R. The actual value is given as the output "mean fitness" in your console

7. X = 9, y = 8.7 (You can obtain this values with the following code lines:
   min(z) #Min value
   which(z == min(z), arr.ind = T)#min position
   xmin <- x[which(z == min(z), arr.ind = T)[1,1]] #9

ymin <- y[which(z == min(z), arr.ind = T)[1,2]] #8.7
With this code you can already have an idea of the values you should expect for x and y when running Ex_iii_GA.R. The actual values are given in the "Best solution :" output in your console.

8. 442.7 (I obtained this value but you will most likely find something different. Run the simulation 10 times and check whenever your fitness of the top 5 individuals reaches equilibrium, in other words where it stops changing)

IV Professional programmer level

Check the GA_salesman.R file