KOÇ ÜNİVERSİTESİ

INTRODUCTION TO COMPUTATIONAL SCIENCE
CMSE 501 & DASC501

POPULATION ASSIGNMENT

China has for many years officially allowed only one child per couple. However, the success of the policy has been somewhat limited. One challenge is the current overrepresentation of males in the population (families have favored sons to live up). An alternative policy is to allow each couple to continue getting children until they get a son. We can simulate both policies and see how a population will develop under the "one child" and the "one son" policies.

These are to be *parametric* and shall be taken from the user (following are the default values):

- Initial **population** N=10,000 individuals
- the **Male/Population ratio** (to be used for initial generation and for Scenario#1 case #2 new born babies' gender) MR=0.49
- **the fertility rate** (the % of parents that can have a baby) FR=0.93
- **max. no of girls in a row** a couple can have G=9
- **generation no.** to be simulated (default 10)

Policy 1 : One Child

Case 1: Use the given MR for all generations requested as fixed ratio
Number of baby boys & girls determined by fixed MR ratio
Baby gender is not determined for parent-base.

Case 2: Use the given MR for the initial population then use the MR calculated using previous population male/female values
Number of baby boys & girls determined by MR ratio of previous population
Baby gender is not determined for parent-base.

Case 3: Use the given MR for the initial population to identify the number or M and F
Baby gender is determined by a random function for each baby of each parent

Policy 2 : One Son

Case 3: Use the given MR for the initial population to identify the number or M and F
Baby gender is determined by a random function for each baby of each parent

In Policy 2 we accept parents try at most 9 times and if they don't get a son they just give up having babies, that's stop at max 9 children (happens if 9 girls in a row) per parent, to make things easier for you.

There will be a simulation for the first 10 generation for each of the following (making total of 4 population simulations):

Policy 1:	Case 1	-- population P1C1
	Case 2	-- population P1C2
	Case 3	-- population P1C3
Policy 2:	Case 3	-- population P2C3

The following information will be displayed for each generation of all 4 population simulations:

Generation *n*

Population Size:	No.of couples :	No.of Parents:
	No.of MALES :	No.of FEMALES:
No.of babies Total:	No.of baby girls:	No.of baby sons:

Note that
1- Policy 1 even though each couple will have 1 child, “No. of babies Total” will be effected by the changing number of couples in each generation whereas, in Policy 2 addition to that there will be the different no. of children per parent.
2- For each generation the no. of baby girls and no. of baby boys will be the next generations no. females and no. of males forming the couples respectively.

Measure the time required for your code to run, see the code snippet below.

Run the simulations for populations of (16 simulations in Total):

a) 10.000 4 Runs = (Policy 1:Case 1,Case 2, Case 3), (Policy 2: Case 3)
b) 100.000 4 Runs = (Policy 1:Case 1,Case 2, Case 3), (Policy 2: Case 3)
c) 1.000.000 4 Runs = (Policy 1:Case 1,Case 2, Case 3), (Policy 2: Case 3)
d) 10.000.000 4 Runs = (Policy 1:Case 1,Case 2, Case 3), (Policy 2: Case 3)

DISCUSSION:

Interpret your results for the above populations of a and c only (10.000 and 1.000.000):

1. Does the policy 1 achieve the desired outcome?
2. How different are the population growth rate for Policy 1 case 1 and case 3?
3. How different are the population growth rates for Policy 1 case 3 and Policy 3 case 3?
4. See how much time is required for each run and write 2-3 sentences comparing and interpreting the results in terms of time.
5. Do you think this policy works as intended or not, regarding your simulation results.

Discuss whether the policy 1 achieves the desired outcome, and at what cost? Discuss also effects of the two policies not only technical but also considering society, in a paragraph.

To measure how long does it take for code to run

from datetime import datetime # we will see this module in detail later, for the moment just use, if you like check the documentation

q = datetime.now() -- at the beginning take the time

here the code to be run

print('--------- SURE - ',datetime.now() - q) # this takes the time and calculates the difference and prints out the required time to run the code in between