CS 278 Lab: Functions

Your task is to generate all possible functions from X={a, b, c} to a set Y. Set Y contains integers 1, …, n for some integer n≥1. The value of n is provided by the user. To define a function you need to specify what it outputs for each element of X. For instance, if Y= {1, 2}, then f(a)=1, f(b)=2, f(c)=2 defines function f from X to Y.

Write a program that prompts the user to enter the size of Y, then generates, enumerates, and prints out in a neat format all possible functions from X to Y. Your program should number generated functions f1, f2, f3, f4, etc. For each generated function, output whether or not it is one-to-one, onto, or a bijection. Compute total number of functions generated, how many of them are one-to-one, how many of them are onto, and how many of them are bijections.

Sample dialog with the user may look like the following (user input is in **green**):

The program will generate all functions from X={a,b,c} to Y={1,…,n}.
Please enter the value of n: **2**
f1(a)=1 f1(b)=1 f1(c)=1
f1 is not one-to-one, not onto, and not a bijection.
f2(a)=1 f2(b)=1 f2(c)=2
f2 is not one-to-one, onto, and not a bijection.
f3(a)=1 f3(b)=2 f3(c)=1
f3 is not one-to-one, onto, and not a bijection.
f4(a)=1 f4(b)=2 f4(c)=2
f4 is not one-to-one, onto, and not a bijection.
f5(a)=2 f5(b)=1 f5(c)=1
f5 is not one-to-one, onto, and not a bijection.
f6(a)=2 f6(b)=1 f6(c)=2
f6 is not one-to-one, onto, and not a bijection.
f7(a)=2 f7(b)=2 f7(c)=1
f7 is not one-to-one, onto, and not a bijection.
f8(a)=2 f8(b)=2 f8(c)=2
f8 is not one-to-one, not onto, and not a bijection.
There are 8 functions total.
0 of them are one-to-one.
6 of them are onto.
0 of them are bijections.

Implementation details:

All possible functions must be automatically generated by your program (e.g., use nested loops to do it). Your program must work for any value of n (n≥1) entered by the user (you may assume that n is no more than 10).

What to submit:

- Submit the source code of your program using Canvas.
- If you write your program in a programming language other than Java, then submit instructions on how to compile and run your program on CS machines.