

CS 1400 Fundamentals of Programming

Programming Project 7: Rabbits, Rabbits, Rabbits

Objective:

At the completion of this project, you will have created a console application that

- makes use of a UML Activity Diagram to describe the steps required to solve the problem
- uses a loop statement
- uses decision logic
- uses arithmetic expressions, assignment, and
- formats the output

Project:

This is another problem solving project. Since I want you to focus on the algorithm part of the problem, you should write this as a Console Program. Once you have figured out the steps required to solve the problem, writing the code should be pretty easy. You should be pretty familiar with doing these steps by now:

1. Write down everything that you know about the problem
2. Draw pictures to help you visualize the problem
3. Write down what it is that your program needs to compute
4. Write down any formulas, equations, or relationships that you might find useful
5. Create an Activity Diagram and Pseudo-code. Then use the activity diagram and the pseudo-code as the basis for writing the code that you submit.

Suppose that a scientist is doing some important research work that requires her to use rabbits in her experiments. She starts out with one pair of adult rabbits (a male and a female). At the end of each month, a pair of rabbits produces one pair of offspring (a male and a female). However, these new offspring will not be able to reproduce until they are a month old, and won't have babies of their own until the following month. To illustrate this, consider the first two months:

At the beginning of month one, the scientist just has the original pair of adult rabbits. The table for month one will look something like

Month	Adults	Babies	Total
1	1	0	1

At the end of month one this pair of adults produces one pair of offspring. Thus, at the beginning of month two the table will look like this:

Month	Adults	Babies	Total
1	1	0	1
2	1	1	2

At the end of month two the adults have another pair of baby rabbits. The first pair of babies, born at the end of last month are not old enough to have babies yet, but we will categorize them as adults. So, at the beginning of month three the table looks like this:

Month	Adults	Babies	Total
1	1	0	1
2	1	1	2
3	2	1	3

The scientist has 500 cages in which to hold her rabbits. Each cage holds one pair of rabbits. Assuming that no rabbits ever die, when will she run out of cages?

Your program must do the following:

1. Print out your student information.
2. Print a table that contains the following information for the beginning of each month.
Stop printing when you run out of cages.
 - The number of months that have passed.
 - The number adult rabbits (those over 1 month old).
 - The number of baby rabbits produced this month.
 - The total number of rabbit pairs in the lab.
3. Calculate and print out how many months it will take until the number of rabbits exceeds the number of available cages.

Format and document your code in accordance with the course style guidelines. Include a file prologue identifying you as the author. Also include an electronic version of you Activity Diagram. Diagrams may be done in Word, or scanned in and sent as an image file. Submit your project using the instructions outlined in the Course Syllabus, Programming Projects section.

File(s) to Submit:

Place your complete project folder into a zip file and name the zip file proj_07_your-initials_V1.0.zip. For example, I would name my file proj_07_RKD_V1.0.zip. Submit this assignment as Project #7 on Canvas.

Hints

If you need help solving this problem, you can find some hints [here](#).

Grading Criteria

Description	Points possible	Your points
Project meets grading guidelines: ◦ Source code files contain a declaration that you did not copy any code ◦ Project has been submitted to Canvas ◦ Code is properly documented ◦ Code meets style guidelines	5	
Your code is adequately commented with pseudo-code.	5	
Your program produces a table as shown in the sample output.	10	
The data in the table is correctly calculated using a loop.	10	
You have noted in which month the number of rabbits exceeds the number of cages. Note that this value must be calculated by your	5	

program.		
Early bonus (+5 pts) or late penalty (20%/day)		
Total	35	

Sample Output:

```

C:\Documents and Settings\faculty\My Documents\Server Backup\1250php\projects\project04\rabbits.exe
Table of rabbit population, in pairs
Month   Adults   Babies   Total
1       1        0        1
2       1        1        2
3       2        1        3
4       3        2        5
5       5        3        8
6       8        5        13
7      13        8        21
8      21       13        34
9      34       21        55
10     55       34        89
11     89      55       144
12    144     89       233
13    233    144       377
14    377    233       610

Will run out of cages in month 14

```

You can get an executable that runs correctly [here!](#)