

REPETITION STRUCTURE

PROGRAMMING AND INFORMATION SYSTEMS - 1º THEAT THE GPSI TECHNICAL PROFESSIONAL COURSE



*"I think ninety-nine times and find nothing; I leave
think, I dive into a deep silence – and behold the
truth is revealed to me."
(Albert Einstein)*



Module 02

Execution Control Mechanisms



Introduction

It is often necessary to repeat a certain number of times a certain instruction or set of instructions.

It is often necessary to maintain, an indeterminate number of times, a cycle ("Loop") of repetitions, as long as a certain condition is met.

This repetition, for the most part, does not have to be an exact repetition of the same operations, as there may be certain data (variables) or parameters that change as the cycle progresses.

Example of repeating structures:

The *for*

The *while*

While in a "for" type structure, the number of times the cycle will be repeated is initially determined by a control variable that is incremented or decremented as the cycle progresses. In the structure "while" the cycle will run an indeterminate number of times, depending on whether or not the control condition is verified - which depends on the events during the cycle itself.



Activity proposal

1. The Navarros decided to build a Kartodromo to have fun when they don't have tests to do.

Each race consists of 5 laps. To know how long each driver takes to do the test, it is necessary to record the times for each lap. Your mission is to create the program that allows you to read the times when passing the finish line and at the end of 5 laps show the total time spent on the Box screen.

2. Make an algorithm to calculate a value A raised to an exponent B (THE_B). Values A and B must be read. Do not use the A^B arithmetic operation.

3. The school's heating system checks temperatures every hour of operation. Management needs to know the temperature range for the class period (9am to 5pm) to figure out which temperature to adjust for classrooms. As Navarros like to program comfortably, we will help the school's management. For that you must develop a program that after reading the hourly temperatures can indicate the minimum and maximum temperature and corresponding thermal amplitude.

4. An air carrier has an airplane that can carry 1000 kg of cargo in the hold. On each trip, the company charges a fee of €20 for each suitcase that you carry. As the weight of the cargo cannot exceed 1000 kg, it is necessary to know in the Check In process the weight of each bag. In this exercise, you must prepare a program that reads the weight of the bags successively and when the load limit is reached, it must indicate that the allowed limit has been reached, showing the value calculated in fees.

5. The elections for the student association are approaching. The traditional process of choosing candidates is based on the piece of paper placed in the ballot box. This process is not only time-consuming (especially when counting the ballots) and is subject to reading errors. This year, Navarros will prepare an innovative solution. Your mission is to create a program on the computer console that successively asks for the letter of the list the student wants to vote for. At the end of the voting period (which will be when the presiding officer presses the letter '0') the program must present the results, that is, the total number of votes that each list managed to obtain.

6. The school wants to know which is the best student in each class. For this, it intends to hire a program that, reading the average of each student, can indicate in each class which is the number of the best student. The program should ask how many students the class has; then read the classification of all students and at the end show the number of the best student.



7. Build the factorial algorithm of a number, that is, the product of all integers from 1 to the chosen number. For example, the factorial of 3 is $1 \times 2 \times 3 = 6$, but the factorial of zero is 1. Use the “To...” structure, but don't forget to note that the factorial of zero is 1.
8. A prime number is a natural number with exactly two divisors, 1 and itself. Prime numbers are important because of the many practical applications they have in the computing world. Design an application that determines whether a natural number is prime or not.
9. Imagine you are a biologist who works in a large laboratory. For the last month he has been following the growth of a culture of his favorite bacteria, *Fortranicus Bacillus*. You are particularly interested in how it grows in hostile environments. Today is the last day of your experience. In advance, you pull out your logbook and place it on the counter, but your enthusiasm is such that you hit a bottle of acid that spills onto the counter, dissolving your work as you look on in despair. You desperately try to recover some statistics. How many individual bacteria did the experiment begin with? He doesn't even remember how many days it has been going on. In desperation he calls his Assistant. “No, I don't remember how many bacteria the experiment began with,” she says. “But I remember it was an odd number. Oh, yes, the number of bacteria has doubled every day”. He looks at the counter, sniffs the acid, and walks back to his desk with a wrinkled nose. Even though you lost your grades, you can still count the total number of bacteria you now have. Combining this with the information from the assistant, you should write a program to answer the initial two questions. That is, you must calculate (i) the number of bacteria you started the experiment with, and (ii) the duration of the experiment.

Determine the number of bacteria at the beginning of the experiment and the duration of the experiment, knowing the total number of bacteria at the end of the experiment.

10. Have you ever heard the expression “Money makes Money”? And it's not that it's true. Banks provide savings products that allow us to monetize our money. Term deposits allow us to capitalize our investment, that is, at the end of each year, they add to the deposited money the interest rate contracted as a permanence bonus. In this exercise we will try to make an investment simulator for time deposits. Thus, by entering the amount, number of years and annual net interest rate (TANL), the program must indicate the amount received at the end of each year. Ex:

Input Data

Amount: 10000

No. Years: 3

TANB: 3%

Output Data:

1st Year: 10300

2nd Year: 10609

3rd Year: 10927

Interest Earned: 927

11. The parity of an integer n is defined as the sum of its bits in binary representation. As an example, the number $20 = 10100$ has two 1s in its binary representation, and therefore it has parity 2. The following figure shows an example of converting from decimal to binary.

$$\begin{array}{r} 20 \div 2 = 10 \text{ remainder } 0 \\ 10 \div 2 = 5 \text{ remainder } 0 \\ 5 \div 2 = 2 \text{ remainder } 1 \\ 2 \div 2 = 1 \text{ remainder } 0 \\ 1 \div 2 = 0 \text{ remainder } 1 \end{array} \quad 20 = 10100_2$$

Conversion from decimal to binary

In this problem you should calculate the parity of an integer given by the user.

GOOD WORK! YOU ARE ABLE! BUILD YOUR KNOWLEDGE...

The subject teachers, Andreia

Backyard | Carlos Almeida