Καθηγητής Πληροφορικής
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http://www.zioulas.gr

**EXERCISES
CHAPTER 1**

VCZ

EXERCISE 1

Fill the missing words in the following sentences:

1. Each problem includes data and _____.
2. During the stage of problem _____ the initial problem needs to be analyzed in individual sub-problems in order to get simpler.
3. Problems whose solution derives from one individual automated procedure are called _____ problems.
4. In a _____ problem a solver tries to find a result that fully satisfies the needs of the problem in the best possible way.
5. A finite set of commands that resolves a problem is called a _____.
6. Each programming language has its own _____ and conceptual rules.
7. Each algorithmic step is called a _____ or an instruction.
8. In a programming environment, the program that makes the conversion from high level language to machine language might be a _____ or an interpreter.
9. Every algorithm must be _____, so each one of its steps to leave no doubt about its correct and successful execution.
10. The executioner of an algorithm might be a human being or a _____.
11. An algorithm that is expressed in a form that its instructions are fully understood and executable by the computer is called a _____.
12. Java, C++ and SQL are examples of modern programming _____.
13. The mother language of computer that is expressed in bits (0 and 1) is called a _____.
14. The program that converts another program from symbolic language to machine language in order to be executed by computer is called a _____.
15. A basic feature of high-level languages is _____. This attribute makes the languages independent from the computer architecture.
16. The set of characters and symbols which are used by a programming language to represent its instructions is called a _____.
17. The _____ errors are caused by a violation of grammatical rules and can be detected by the compiler during translation.
18. The set of grammatical _____ that constitute a programming language makes up its syntax.
19. The _____ errors are caused by an incorrect algorithm and cannot be detected by a compiler.
20. A low-level language also known as symbolic language or _____ uses symbolic names instead of numbers to express its commands.

EXERCISE 2

Each year the middle school students should perform their elections to constitute the 5 member council of their classes. Having that in mind, try to answer the following questions.

A) In which individual sub-problems can the problem of student elections be analyzed?
B) What are the advantages of the analysis of the problem into individual sub-problems?
C) What is the execution environment of this particular problem?
D) Based on 3 criteria of problem classification, what kind of problem is that?

Match the numbers of column A with the letters of column B for each one of the following tables:

Chart1

column A (algorithmic attribute)	column B (explanation of attribute)
1) clear	**A)** it is able to resolve a variety of relative problems
2) effective	**B)** it resolves the problem in a finite time period
3) feasible	**C)** it requires as fewer resources as possible
4) fast	**D)** it is executable by a particular executioner (human or machine)
5) economic	**E)** all steps leave no doubt about their correct execution
6) general	**F)** it uses the least possible number of steps

Chart2

column A (type of problem)	column B (example of problem)
1) Computational	**A)** Is there life on other planets?
2) Decision	**B)** Is a number odd or even?
3) Open	**C)** What is the shortest route to a location?
4) Optimization	**D)** What transportation mean will we choose for our trip?
5) Unsolved	**E)** the resolving of a linear equation
6) Semi-structured	**F)** the squaring of a circle
	G) the finding of the lowest average grade in class
	H) the calculation of the product of two numbers

EXERCISE 4

Given the following algorithm which calculates your age, answer the following questions:

- *Give the current year*
- *Give the year of your birth*
- *Calculate your age by adding the current year and year of your birth*
- *Show the age you calculated*

A) Is this algorithm clear and intelligible?
B Is this algorithm completed after finite number of steps.
C) Does this algorithm give correct results?
D) If there is an error in the previous algorithm, what type of error is that?

EXERCISE 5

Based on your prior knowledge and experience, try to list a variety of problems which:

A remain unsolved

B) remain open

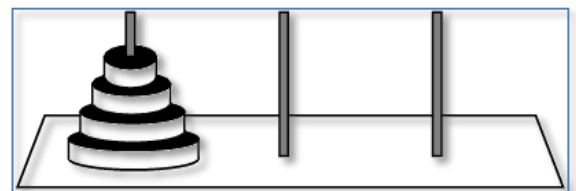**C)** are optimization problems

EXERCISE 6

Why do you think there is a big number of **programming languages** today? Could they all be replaced by one individual programming language that could be able to cover fully their needs?

EXERCISE 7

In Towers of Hanoi you need to move all the discs from left pile to the right pile and stack them according to the original order.

List the steps of the algorithm that resolves the Towers of Hanoi considering that the number of discs are 4.
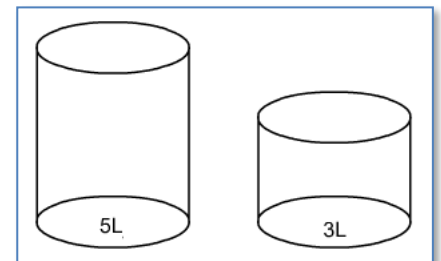
This particular problem can be found in the following web page: http://www.mazeworks.com/hanoi/index.htm

EXERCISE 8

List the steps of the algorithm that resolves the following problem of measuring water:

You have 2 containers of water. The first holds 5 liters and the second 3 liters. Can you measure out exactly 4 liters of water using only these two containers and unlimited amount of water?
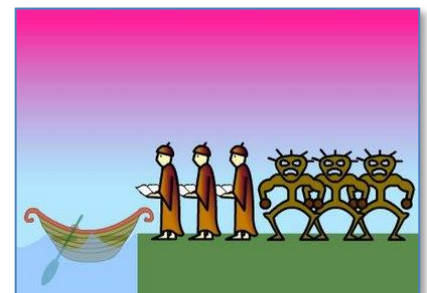
This particular problem can be found in the following web page: http://users.ntua.gr/ge01033/mpoukalia.htm

EXERCISE 9

List the steps of the algorithm that resolves the following problem of missionaries and cannibals:

There are 3 missionaries and 3 cannibals who want to cross a river using a boat which can carry only 2 people. Their transfer must be done in such a way that for both shores, if there are missionaries present on the shore, they cannot be outnumbered by cannibals (if they were, the cannibals would eat the missionaries). It is obvious that the boat cannot cross the river by itself with no people on board.

This particular problem can be found in the following web page:
http://games.softpedia.com/get/Freeware-Games/Missionaries-and-Cannibals.shtml

List the steps of the algorithm that resolves the following problem of measuring water:

Let's say there are 2 jars of water. The first jar of water has 9L capacity when the second jar of water 4L capacity.

How can you put exactly 6L of water inside the first jar? Consider that you have available an unlimited amount of water.