TITLE
CSP. ECLiPSe CLP

OBJECTIVES
- Solving Constraint Satisfaction Problems using Constraint Logic Programming (CLP)

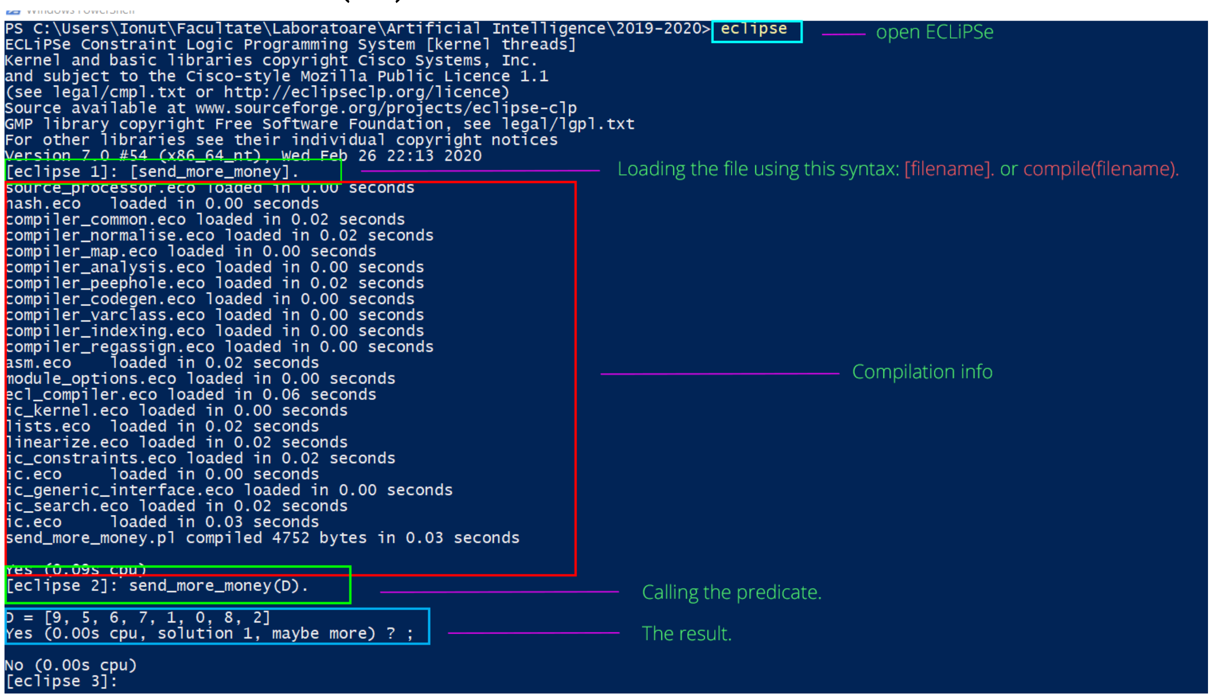
PREREQUISITES
- ECLiPSe - Download
- Course 7

RESOURCES
- ECLiPSe - A Tutorial Introduction PDF
- ECLiPSe - A Tutorial Introduction HTML

LAB
Configure ECLiPSe CLP
1. Using the download link in the Prerequisites section download the suitable version of ECLiPSe for your operating system.
2. The installation should be straight-forward (Next...Finish).
3. Well done! You have successfully installed the tool.

Write and Run your first CLP program (You can use the .pl file provided in Classroom [send_more_money.pl])
1. Create a new .pl or .ecl file in which you will write your code.
2. Implement your code in this file using a text editor of your choice.
3. Now, for running your program you have two options:

a. **Command Line Interface (CLI)**

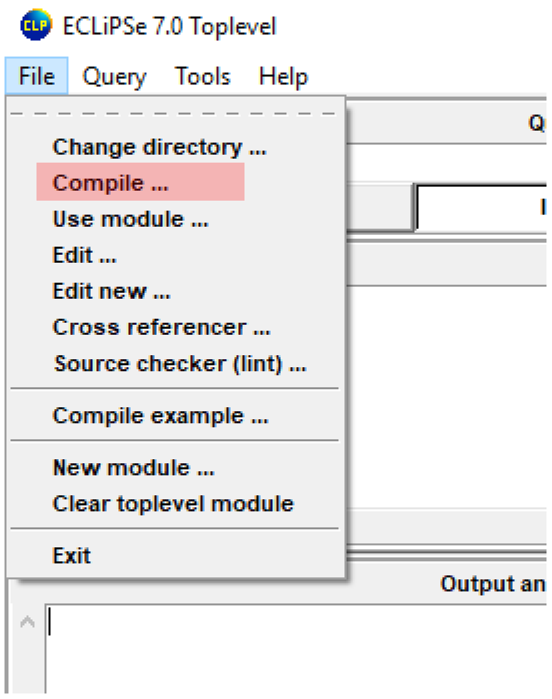


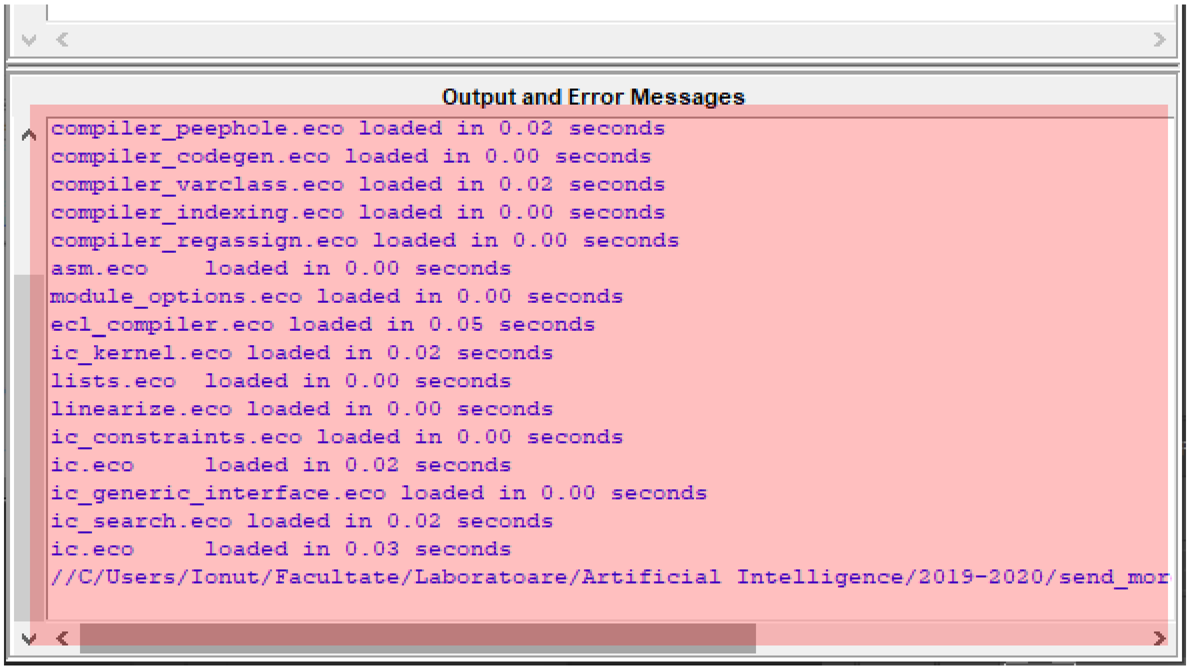
```
PS C:\Users\Ionut\Facultate\Laboratoare\Artificial Intelligence\2019-2020> eclipse
ECLiPSe Constraint Logic Programming System [kernel threads]
Kernel and basic libraries copyright Cisco Systems, Inc.
and subject to the Cisco-style Mozilla Public Licence 1.1
(see legal/cmpl.txt or http://eclipseclp.org/licence)
Source available at www.sourceforge.org/projects/eclipse-clp
GMP library copyright Free Software Foundation, see legal/lgpl.txt
For other libraries see their individual copyright notices
Version 7.0 #54 (x86_64_nt), Wed Feb 26 22:13 2020
[eclipse 1]: [send_more_money].
source_processor.eco loaded in 0.00 seconds
hash.eco   loaded in 0.00 seconds
compiler_common.eco loaded in 0.02 seconds
compiler_normalise.eco loaded in 0.02 seconds
compiler_map.eco loaded in 0.00 seconds
compiler_analysis.eco loaded in 0.00 seconds
compiler_peephole.eco loaded in 0.02 seconds
compiler_codegen.eco loaded in 0.00 seconds
compiler_varclass.eco loaded in 0.00 seconds
compiler_indexing.eco loaded in 0.00 seconds
compiler_regassign.eco loaded in 0.00 seconds
asm.eco    loaded in 0.02 seconds
module_options.eco loaded in 0.00 seconds
ecl_compiler.eco loaded in 0.06 seconds
ic_kernel.eco loaded in 0.00 seconds
lists.eco  loaded in 0.02 seconds
linearize.eco loaded in 0.02 seconds
ic_constraints.eco loaded in 0.02 seconds
ic.eco     loaded in 0.00 seconds
ic_generic_interface.eco loaded in 0.00 seconds
ic_search.eco loaded in 0.02 seconds
ic.eco     loaded in 0.03 seconds
send_more_money.pl compiled 4752 bytes in 0.03 seconds

Yes (0.09s cpu)
[eclipse 2]: send_more_money(D).

D = [9, 5, 6, 7, 1, 0, 8, 2]
Yes (0.00s cpu, solution 1, maybe more) ? ;

No (0.00s cpu)
[eclipse 3]:
```

open ECLiPSe
Loading the file using this syntax: [filename]. or compile(filename).
Compilation info
Calling the predicate.
The result.

[Read more here.](#)

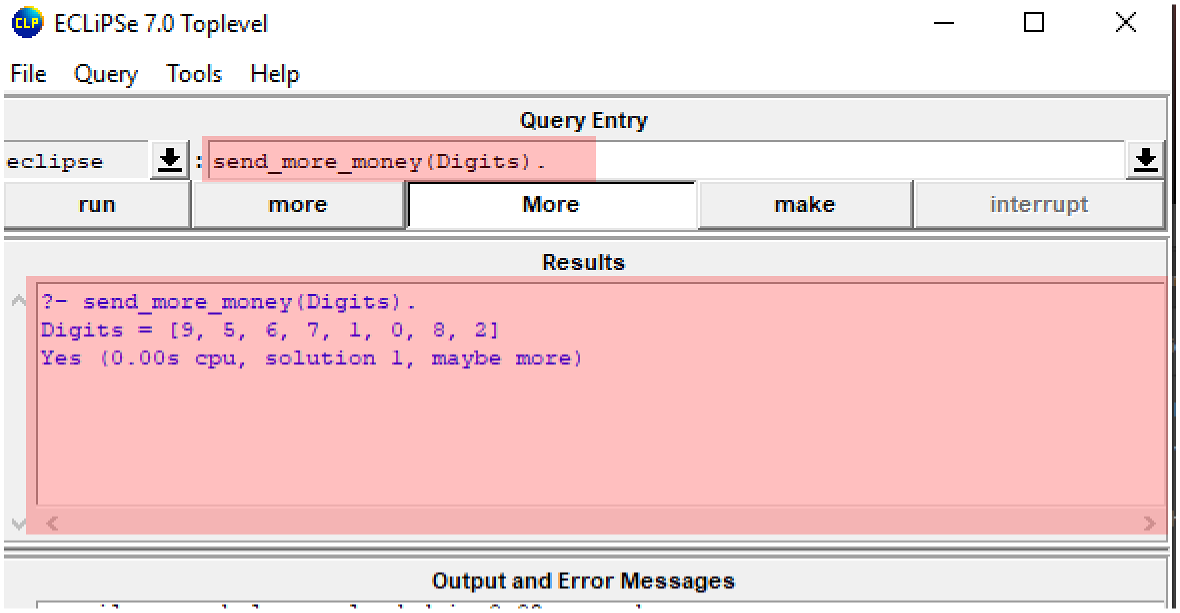
b. **TkEclipse (GUI)**
Open the file: File -> Compile





```
compiler_peephole.eco loaded in 0.02 seconds
compiler_codegen.eco loaded in 0.00 seconds
compiler_varclass.eco loaded in 0.02 seconds
compiler_indexing.eco loaded in 0.00 seconds
compiler_regassign.eco loaded in 0.00 seconds
asm.eco    loaded in 0.00 seconds
module_options.eco loaded in 0.00 seconds
ecl_compiler.eco loaded in 0.05 seconds
ic_kernel.eco loaded in 0.02 seconds
lists.eco  loaded in 0.00 seconds
linearize.eco loaded in 0.00 seconds
ic_constraints.eco loaded in 0.00 seconds
ic.eco     loaded in 0.02 seconds
ic_generic_interface.eco loaded in 0.00 seconds
ic_search.eco loaded in 0.02 seconds
ic.eco     loaded in 0.03 seconds
//C/Users/Ionut/Facultate/Laboratoare/Artificial Intelligence/2019-2020/send_mor
```

If any error (errors will be displayed in red) in the output means that file was loaded and the code was successfully compiled.
Next, you have to run a new query. Write your predicate in the query input and click the "Run" button.



```
send_more_money(Digits).
```

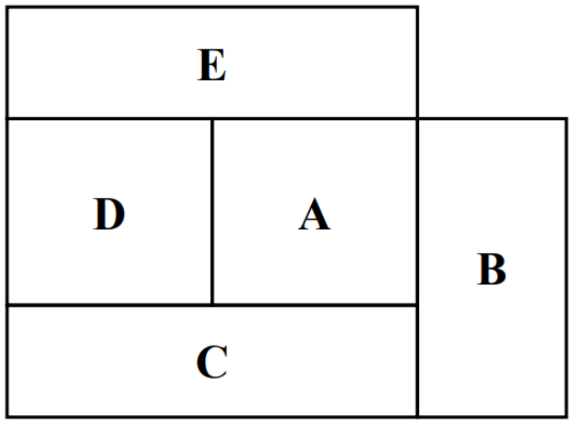
```
?- send_more_money(Digits).
Digits = [9, 5, 6, 7, 1, 0, 8, 2]
Yes (0.00s cpu, solution 1, maybe more)
```

As you can see the result is then displayed in the "Results" panel.

Please analyze the provided code for the SEND+MORE = MONEY cryptarithmetic problem and try to solve as many exercises as you can.

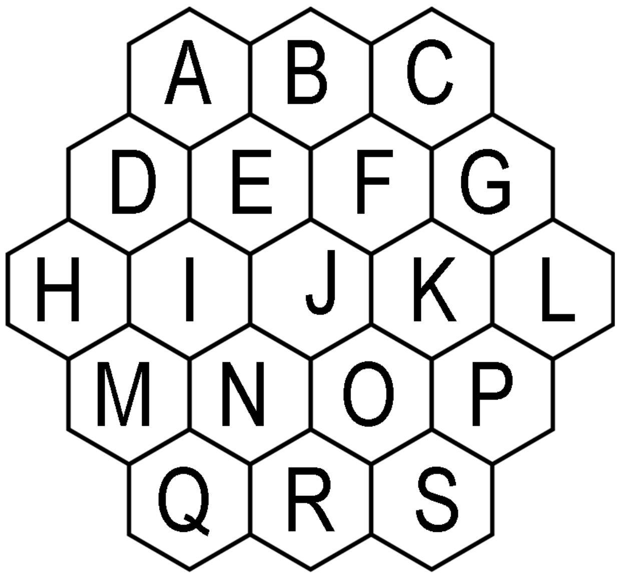
Exercises:

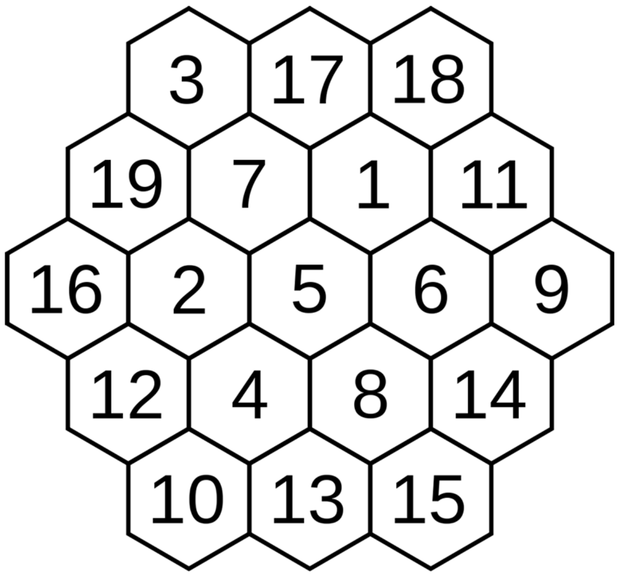
1. Implement TWO + TWO = FOUR example in Course 7 example in ECLiPSe. This problem is similar to the SEND+MORE = MONEY problem.
2. Implement Map Coloring problem in ECLiPSe.



You have a map with 5 surfaces and 4 colors available. You have to write a CLP program that will help us to color the figure so that we will not have two neighbor surfaces colored with the same color. HINT: map your colors with integers.

3. A magic hexagon consists of the number 1 to 19 arranged in a hexagonal pattern:





We have a constraint that all diagonals sum to 38. That is, A+B+C = D+E+F+G = ... = Q+R+S = 38, A+D+H = B+E+I+M = ... = L+P+S = 38, C+G+L = B+F+K+P = ... = H+M+Q = 38.