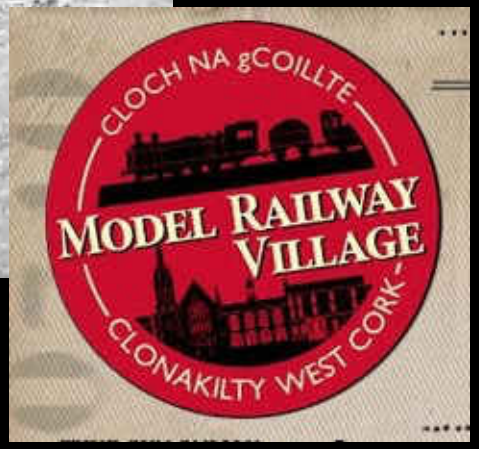
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Modelling I

Exercise:

Last lecture

(M Java is on your system)
ure Eclipse is on your system)
D wnload and install Choco as an Eclipse project

Model and solve the following problem:

V = {V1,V2,V3,V4}
D = {1,2,3,4,5} for each var
C = {V1 ≤ V4-1,
V1 < V2,
V2 + V3 > 6,
V2 + V4 = 5,
V4 < V3}

```
import org.chocosolver.solver.Solver;
import org.chocosolver.solver.constraints.IntConstraintFactory;
import org.chocosolver.solver.trace.Chatterbox;
import org.chocosolver.solver.variables.IntVar;
import org.chocosolver.solver.variables.VariableFactory;

public class FirstExercise {
    public static void main(String[] args) {
        //create a solver object that will solve the problem for us
        Solver solver = new Solver();

        //create the variables and domains for the problem, and add to the solver
        IntVar V1 = VariableFactory.enumerated("V1", 1, 5, solver);
        IntVar V2 = VariableFactory.enumerated("V2", 1, 5, solver);
        IntVar V3 = VariableFactory.enumerated("V3", 1, 5, solver);
        IntVar V4 = VariableFactory.enumerated("V4", 1, 5, solver);

        //create the constraints
        solver.post(IntConstraintFactory.arithm(V1, "-", V4, "<=", -1));
        solver.post(IntConstraintFactory.arithm(V1, "<", V2));
        solver.post(IntConstraintFactory.arithm(V2, "+", V3, ">", 6));
        solver.post(IntConstraintFactory.arithm(V2, "+", V4, "=", 5));
        solver.post(IntConstraintFactory.arithm(V4, "<", V3));

        Chatterbox.showSolutions(solver); //just show the final result

        //ask the solver to find a solution
        solver.findSolution();

        Chatterbox.printStatistics(solver);
    }
}
```

Note: represent
$V1 \leq V4-1$
as
$V1 - V4 \leq 1$

Solutions: {(1,2,5,3), (1,3,4,2), (1,3,5,2)}

Remembering my PIN

I find it difficult to remember my PIN, but we are not supposed to write it down, so I have created a constraint problem whose solution is the PIN.

- my PIN has 4 digits (a-b-c-d) and all of them are different
- the two-digit number *cd* is 3 times the two-digit number *ab*
- the two digit number *bc* is 2 times the two-digit number *da*

What is my PIN?

Model this problem as a CSP, and then implement it in Choco

Next lecture ...

More modelling