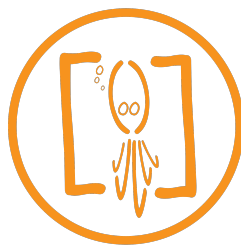


CHOCO SOLVER  
<http://choco.emn.fr/>

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## Exercises (fr)

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10 janvier 2011

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# Table des matières



# Preface

Choco is a java library for constraint satisfaction problems (CSP) and constraint programming (CP). It is built on a event-based propagation mechanism with backtrackable structures. Choco is an open-source software, distributed under a **BSD licence** and hosted by [sourceforge.net](http://sourceforge.net). Pour plus d'informations, visiter le site <http://choco.emn.fr>.

Ce document est organisé de la façon suivante :

- Des exercices pour [débutants](#), [faux débutants](#), ...



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# Première partie

## Debutant





On commence doucement. Liste des contraintes et opérateurs rencontrés dans les prochains exercices :

- GT
- NEQ
- EQ
- LT
- SCALAR
- PLUS
- MAX

## 0.1 Sudoku

<http://fr.wikipedia.org/wiki/Sudoku>

Le sudoku est un jeu en forme de grille, inspiré du carré latin. Le but du jeu est de remplir la grille avec une série de chiffres (ou de lettres ou de symboles) tous différents, qui ne se trouvent jamais plus d'une fois sur une même ligne, dans une même colonne ou dans une même sous-grille. La plupart du temps, les symboles sont des chiffres allant de 1 à 9, les sous-grilles étant alors des carrés de 3 x 3. Quelques symboles sont déjà disposés dans la grille, ce qui autorise une résolution progressive du problème complet.

		7	5			3		
	4			2		1		
1				7			5	
		3	1	4		2		6
4				6	2	7		
	6	5		3				8
	7	1				6		
8								
	5		7				4	1

- Comment modéliser ce problème ?
- Une propagation suffit-elle ?
- Modéliser ce problème avec des contraintes *allDifferent*. Quelles sont les différences notables ?

```
Model m = new CPMModel();

/* Declaration des cases de la grille */
IntegerVariable[] [] lignes = Choco.makeIntVarArray("c", 9, 9, 1, 9);

/* Declaration des colonnes de la grille */
IntegerVariable[] [] colonnes = new IntegerVariable[9][9];
for(int i = 0; i < 9; i++){
    for(int j = 0; j < 9; j++){
```

```

        colonnes[i][j] = lignes[j][i];
    }
}

/* Declaration des blocks */
IntegerVariable[] [] blocks = new IntegerVariable[9][9];
for (int i = 0; i < 3; i++) {
    for (int j = 0; j < 3; j++) {
        for (int k = 0; k < 3; k++) {
            blocks[j + k * 3][i] = lignes[(k * 3)][i + j * 3];
            blocks[j + k * 3][i + 3] = lignes[1 + k * 3][i + j * 3];
            blocks[j + k * 3][i + 6] = lignes[2 + k * 3][i + j * 3];
        }
    }
}

/* Contraintes d'inegalites par lignes, colonnes et blocks */
for (int l = 0; l < 9; l++) {
    for (int c = 0; c < 9-1; c++) {
        for (int _c = c+1; _c < 9; _c++) {
            m.addConstraint(Choco.neq(lignes[l][c], lignes[l][_c]));
            m.addConstraint(Choco.neq(colonnes[l][c], colonnes[l][_c]));
            m.addConstraint(Choco.neq(blocks[l][c], blocks[l][_c]));
        }
    }
}

/* Lecture de l'instance */
for(int i = 0; i < 9; i++){
    for(int j =0; j < 9; j++){
        if(instance[i][j]>0){
            m.addConstraint(Choco.eq(lignes[i][j], instance[i][j]));
        }
    }
}

Solver s = new CPSolver();
s.read(m);
ChocoLogging.setVerbosity(Verbosity.VERBOSE);
s.solve();

```

À retenir

- Variables temporaires
- Différence entre contraintes locales / contraintes globales
- Statistiques : temps d'exécution, nombre de noeuds, nombre de backtracks, ...
- propagation – résolution

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# Deuxième partie

## Faux débutant



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On passe à la vitesse supérieure.



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