

# 1 E.A.5.3

## 1.1 Modellazione (Cards)

### 1.1.1 Variabili e domini

Dati i parametri  $k, n \in \mathbb{N}$  t.c.  $k \geq 2, n > 0$

- $X = X_C \cup X_P$  t.c.
  - $X_C = \{C_i \mid i \in \{1, \dots, kn\}\}$
  - $X_P = \{P_i \mid i \in \{1, \dots, kn\}\}$
- $D = D_C \cup D_P$  t.c.
  - $D_C = \{D_{C_i} \mid \exists C_i \in X_C \wedge D_{C_i} = \{1, \dots, n\}\}$
  - $D_P = \{D_{P_i} \mid \exists P_i \in X_P \wedge D_{P_i} = \{1, \dots, kn\}\}$

### 1.1.2 Vincoli

- $C = C_{\text{cards}} \cup C_{\text{pos}} \cup \text{alldifferent}(P_1, \dots, P_n)$  t.c.

$$\begin{aligned}
 C_{\text{cards}} = \{ \langle \{C_r\}, R \rangle \mid \\
 & C_r \in X_C \wedge \\
 & \exists i, j \\
 & \quad i \in \{1, \dots, n\} \wedge \\
 & \quad j \in \{1, \dots, k\} \wedge \\
 & \quad r = (i - 1) * k + j \wedge \\
 & \quad R = \{i\} \\
 & \}
 \end{aligned} \tag{1}$$

$$\begin{aligned}
 C_{\text{pos}} = \{ \langle \{P_{r-1}, P_r\}, R \rangle \mid \\
 & P_{r-1} \in X_P \wedge \\
 & P_r \in X_P \wedge \\
 & \exists i, j \\
 & \quad i \in \{1, \dots, n\} \wedge \\
 & \quad j \in \{2, \dots, k\} \wedge \\
 & \quad r = (i - 1) * k + j \wedge \\
 & \quad R = \{(x, y) \mid x, y \in \{1, \dots, k * n\} \wedge y = x + C_r + 1\} \\
 & \}
 \end{aligned} \tag{2}$$

## 1.2 Istanziamento

### 1.2.1 Variabili e domini

Dati  $k = 2, n = 4$

- $X = X_C \cup X_P$  t.c.
  - $X_C = \{C_1, C_2, C_3, C_4, C_5, C_6, C_7, C_8\}$
  - $X_P = \{P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8\}$
- $D = D_C \cup D_P$ 
  - $D_C = \{D_{C_1}, D_{C_2}, D_{C_3}, D_{C_4}, D_{C_5}, D_{C_6}, D_{C_7}, D_{C_8} \mid D_{C_i} = \{1, \dots, n\}\}$
  - $D_P = \{D_{P_1}, D_{P_2}, D_{P_3}, D_{P_4}, D_{P_5}, D_{P_6}, D_{P_7}, D_{P_8} \mid D_{P_i} = \{1, \dots, kn\}\}$

### 1.2.2 Vincoli

- $C = C_{\text{cards}} \cup C_{\text{pos}} \cup \text{alldifferent}(P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8)$

$$\begin{aligned}
 C_{\text{cards}} = \{ & \\
 & \langle \{C_1\}, \{1\} \rangle, \\
 & \langle \{C_2\}, \{1\} \rangle, \\
 & \langle \{C_3\}, \{2\} \rangle, \\
 & \langle \{C_4\}, \{2\} \rangle, \\
 & \langle \{C_5\}, \{3\} \rangle, \\
 & \langle \{C_6\}, \{3\} \rangle, \\
 & \langle \{C_7\}, \{4\} \rangle, \\
 & \langle \{C_8\}, \{4\} \rangle \\
 & \}
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 C_{\text{pos}} = \{ & \\
 & \langle \{P_1, P_2\}, \{(1, 2), (2, 3), (3, 4), (4, 5), (5, 6), (6, 7), (7, 8)\} \rangle, \\
 & \langle \{P_3, P_4\}, \{(1, 3), (2, 4), (3, 5), (4, 6), (5, 7), (6, 8)\} \rangle, \\
 & \langle \{P_5, P_6\}, \{(1, 4), (2, 5), (3, 6), (4, 7), (5, 8)\} \rangle, \\
 & \langle \{P_7, P_8\}, \{(1, 5), (2, 6), (3, 7), (7, 8)\} \rangle, \\
 & \}
 \end{aligned} \tag{4}$$

## 1.3 Codifica in MiniZinc

```
include "alldifferent.mzn";

int: k = 3;
int: n = 10;

array[1..k * n] of var 1..n: cards;
array[1..k * n] of var 1..k * n: positions;

constraint forall(i in 1..n, j in 1..k)(
    cards[(i - 1) * k + j] == i
);

constraint forall(i in 0..n - 1, j in 2..k)(
    positions[i * k + j] ==
        positions[i * k + j - 1] + cards[i * k + j] + 1
);

constraint alldifferent(positions);
```