Modelling in MiniZinc

1 Fair pricing

Three brothers all have adjacent farms. They decide to go to market together to sell off there goods: The first brother has 5 sheep, 1 cow, and 3 pigs, the second brother has 2 sheep, 3 cows and 5 pigs, while the third brother has no sheep, 4 cows and 4 pigs. They agree to set the prices of each kind of animal so that (presuming they sell everything) each brother receives at least 30 coins, and to minimize the maximum difference in amount received by any 2 brothers. The price for each kind of animal is from 1 to 10 coins.

Write a MiniZinc model to determine the prices they should set.

What if they minimize the sum of the differences in amounts received between each pairing of brothers. Modify your model to determine this.

2 Magic Square

A magic square of size n is an arrangement of the numbers from 1 to n^2 in a square so that each row, column and major diagonal all sum to the same value.

Write a Minizinc model to generate a 3x3 magic square. How many are there? How many "really different" 3x3 magic squares are there?

8	3	4
1	5	9
6	7	2

Generalize the model to generate an $n \times n$ magic square. How big an n can your model find a solution for (in reasonable time)?

3 Assigning Tasks to Workers

There are four office tasks and four workers. The cost for the task when done by each worker is given by the table below.

	Sorting	Stapling	Mailing	Filing
Adam	18	13	16	12
Bob	20	15	19	10
Cath	25	19	18	15
Diane	16	9	12	8

Build a MiniZinc model for assigning these workers to tasks which minimizes the cost.

Once you have that working, generalize the MiniZinc model so that the data for this particular instance is in a separate data file (.dzn). Use this model to solve the problem below as well.

	a	b	c	d	e	f	g
A	21	15	19	10	16	20	22
B	16	11	12	8	13	17	17
C	25	19	18	15	15	19	16
D	23	17	16	16	17	18	21
E	18	13	16	12	11	15	18
F	17	12	11	10	19	16	16