Introductory Problems (Exercices)

The goal of this assignment is to introduce you to the modeling of combinatorial constrained problems. For each problem, you have to develop a model described in formal (mathematical) terms by means of a constraint network.

1   Zebra

Figure 1: In which house lives the zebra? (image from /commons.wikimedia.org)

The Zebra puzzle (sometimes referred to as Einstein's puzzle) is defined as follows. There are five houses in a row, numbered from left to right. Each of the five houses is painted a different color, and has one inhabitant. The inhabitants are all of different nationalities, own different pets, drink different beverages and have different jobs. We know that:

- colors are: yellow, green, red, white, and blue

- nations of inhabitants are: italy, spain, japan, england, and norway

- pets: are cat, zebra, bear, snails, and horse

- drinks: are milk, water, tea, coffee, and juice

- jobs: are painter, sculptor, diplomat, pianist, and doctor

- The painter owns the horse

- The diplomat drinks coffee

- The one who drinks milk lives in the white house

- The Spaniard is a painter

- The Englishman lives in the red house

- The snails are owned by the sculptor

- The green house is on the left of the red one

- The Norwegian lives on the right of the blue house

- The doctor drinks milk

- The diplomat is Japanese

- The Norwegian owns the zebra

- The green house is next to the white one

- The horse is owned by the neighbor of the diplomat

- The Italian either lives in the red, white or green house

2 Chestnuts
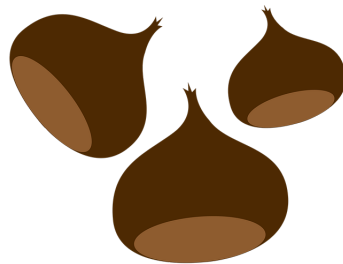

Figure 2: How many chestnuts did each girl get? <small>(image from /pixabay.com)</small>

Sam Loyd (1841-1911), America's most famous puzzle expert, presented the following problem:

> "After gathering 770 chestnuts, the three little girls divided them up so that their amounts were in the same proportion as their ages. As often as Mary took four chestnuts, Nellie took three, and for every six that Mary received, Susie took seven. How many chestnuts did each girl get?"

3 Just Forgotten

Just forgotten (Enigma 1517, Bob Walker, New Scientist magazine, October 25, 2008)

Joe was furious when he forgot one of his bank account numbers. He remembered that it had all the digits 0 to 9 in some order, so he tried the following four sets without success:

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9 4 6 2 1 5 7 8 3 0
8 6 0 4 3 9 1 2 5 7
1 6 4 0 2 9 7 8 5 3
6 8 2 4 3 1 9 0 7 5
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When Joe finally remembered his account number, he realised that in each set just four of the digits were in their correct position and that, if one knew that, it was possible to work out his account number. What was it?