15-381 Assignment 01

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1: Task 1.1

Formulation one:

Variables:
B, M, S, H, P, C, where each variable has domain $\{1, 2, 3, 4, 5, 6\}$

Constraints:
(define $m(n) = (n \mod 6) + 1$)

1. $BMSHPC$ must be distinct values
2. $m(B - M) = 1$
3. $m(S - H) = 1$
4. $m(H - P) = 1$
5. $m(P - C) \neq 1$, $m(S - C) \neq 1$, $m(H - C) \neq 1$
6. $C = 1$

Formulation two:

Variables:
$A_1, A_2, A_3, A_4, A_5, A_6$, where each variable A_i represents the person or animal sitting in seat i, and has domain $\{A, B, C, D, E, F\}$

Constraints:
(define $m(n) = (n \mod 6) + 1$)
TODO

Lastly, (TODO Why inefficient to run AC3 with more constraints?)

2: Task 1.2

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3: Task 1.3

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4: Task 1.4

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5: Task 1.5

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6: Task 2.1

If X_i has constraint $X_i = c$, let its domain $D_i = \{c\}$ (the singleton set containing c) Then the constraint is no longer necessary.

7: Task 2.2

$X_1 + X_2 = X_3$

Make a variable called Z, and let its domain be a pair of values, where the first value may be in the domain of X_1 and the second in the domain of X_2. Then the three equivalent binary constraints are:

1. $Z[1] = X_1$
2. $Z[2] = X_2$
3. $Z[1] + Z[2] = X_3$

8: Task 2.3

$X_1 + X_2 + ... + X_{n-1} = X_n$

Let Z be an $n-1$ tuple. ¡TODO domain¿ Then you need a minimum of n constraints:

1. $Z[1] = X1$
2. $Z[2] = X2$
3. ...
4. $Z[n-1] = X_{n-1}$
5. $Z[1] + Z[2] + ... + Z[n-1] = X_n$

(Not good at latex but that should be 1 - n.

9: Task 2.4

Given an n-ary constraint, stuff $n-1$ of the variables into a new variable, let that be Z in this discussion. Then, create $n-1$ constraints, where $Z[i] = X_i$ for $i = 1$ to $n-1$ Then create an additional constraint, which is the original constraint, but substitute the variables with Z and a positional index. ($X_i -> Z[i]$)

Why? TODO