

MiniZinc

1 Guidelines

- Implementation to go in `examstudy.mzn` and `examstudyx.mzn`.
- There are several instance data files included for you to test your models on. Report a summary of your run time in your report.
- The aim of this assignment is for you to get familiar with Minizinc, so it is important that your codes are properly commented.
- You do not need to have a long report. Just a short one that summarises the steps you take to solve the assignment and some of your findings.

2 Problem Statement

You have a number of exams to study for and only D days remaining before the exam period begins, each with H hours (an even number) available for study, split into a morning session and an afternoon session. The requirement is to create a study plan that starts as late as possible so that you can slack on as long as possible. The constraints of the problem are:

- There is a set of topics to study TOPIC.
- Each topic t requires $hours[t]$ continuous hours of study (although you can start one afternoon, and continue the next morning)
- Some topics must be completed before others are begun.
- Some topics have to be started first thing in the morning when you are freshest.

- Some days, only the morning is available since you have sporting commitments in the afternoon.

Data for the problem is defined as follows:

```
enum TOPIC;
array[TOPIC] of int: hours; %hours study per topic
int: m; %no of precedences
set of int: PREC = 1..m;
array[PREC] of TOPIC: before; % topic that must be finished before
array[PREC] of TOPIC: after; % topic after starts
set of TOPIC: morning; % which topics must start at morning
int: D; % number of days
int: H; % hours per day (even)
constraint assert(H mod 2 = 0, "Hours per day H must be even");
set of int: DAY = 1..D;
set of DAY: HALF; & days where only morning is available
```

A small data set is given in the following:

```
TOPIC = { BMATHS, AMATHS, ENGLISH, CHEM, PHYS };
hours = [2,5,4,3,6];
m = 2;
before = [BMATHS,CHEM];
after = [AMATHS,PHYS];
morning = AMATHS,CHEM;
D = 5;
H = 8;
HALF = {3,4};
```

3 Build a Model (60 Marks)

Build a MiniZinc model in examstudy.mzn for the problem described above. Explain your main steps in the report.

What are the three main parts of this problem? Explain them in the report.

4 Extension (40 Marks)

Actually, you have realised that if you break a study session overnight, it is not effective. In your solutions to the previous section, see if any course will be broken overnight; if not, are there any constraints that avoid this from happening?

Modify your model to create `examstudyx.mzn`, which enforces that no TOPIC is studied across the break in a day. Explain the step you take and compare the solution you get with those in the previous section for data set `e0`.