Middle East Technical University
Department of Computer Engineering

CENG 111

Fall '96

Worksheet 3

REGULATIONS

Due date: 7 January 1997, Tuesday *(Not subject to postpone)*

Submission: Electronically. You will be submitting your program source code through a file which you will name as `hw3.scm` by issuing the following single line at the Unix prompt.

```
submit111 hw3.scm
```

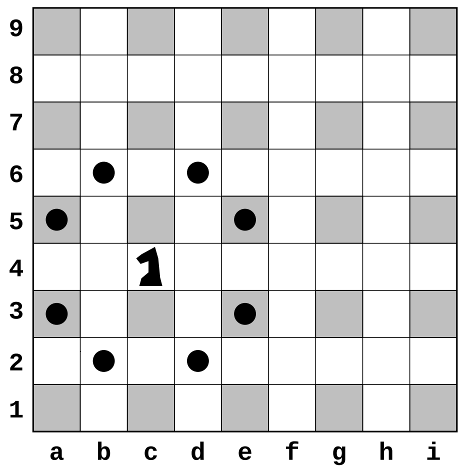
Resubmission is allowed (till the last moment of the due date), the last will replace the previous, provided you answer the interactive question positively.

Team: There is **no** teaming up. The homework has to be done/turned in individually.

Cheating: All parts involved (source(s) and receiver(s)) get zero.

PROBLEM

Cover a chess board by knights ("at" in Turkish chess terminology). In a covered chess board each square is occupied by a knight or under attack by some knight (or both). Below you see for an arbitrary placed knight the squares under attack *(Marked with a black spot)*.



It is not important whether some knights attack each other. Clearly it is desirable to achieve a covering by using a minimum number of knights. It is known that a standard 8×8 chess board can be covered by 12 knights.

SPECIFICATION

You are asked to write a Scheme procedure, called cover, that covers an $n \times n$ chessboard with k knights. More precisely,

```
(cover n k)
```

should yield a sentence with k words each showing the position of a knight on the board. If a coverage is not possible the yielded sentence should be empty.

A word will be of the form cr where c is a letter `a` through `i` denoting a column and `r` is a digit `1` through `9` denoting a row where `a1` denotes the southwest corner. This is a standard notation for positions on a chess board.

Notice we have assumed that

$$1 \leq n \leq 9$$

to simplify data representation.

HINT

Study the 8-queens problem carefully. It is a classic. Reading *Chapter 16* of the text, with particular attention to the section on "backtracking", will also help.