CS1112 Section Exercise 11

1 Where to put your long-burning light bulb?

In this exercise, you need to think about the problem and *come up with a plan* to solve it. Think about the approach that you will take and the functions you may need to write in answering the question.

Refer to the dot-matrix examples from Lecture 21 in which a digit is displayed on a 7×5grid of lightbulbs. Suppose you have one extra-long-life light bulb that can be used in the 7×5 board. In which position of the 7×5 board would you put this special long-life light bulb? Assume that function `digitToShow` is given and the display board displays the digit returned by the function:

```
function n = digitToShow()
% n is the next digit to be displayed on the 7-by-5 display board. n is an integer, 0<=n<=9.
```

Assume this function is given and use it in your solution—don't assume that all digits are equally likely to occur.

Further assume that a bulb (i,j) that is in a lit part of the board simply stays on—instead of first turning off and then back on—when the display changes to another digit that requires bulb (i,j) to be on. Answer the question for these two separate cases:

1. The longer that a bulb is on, the more it degrades.
2. Switching a bulb on (and off) frequently causes it to degrade. (Assume that continuous burning doesn't degrade the bulb.)

Assume the availability of function `TheDigits`, shown in lecture, that returns a 10-by-1 cell array `D` such that `D{k}` is the matrix encoding digit `k`. *Part of* the function is shown below:

```
function D = TheDigits()
% D is a 10-by-1 cell array.
% D{k} is a 7-by-5 matrix that encodes the digit k. (D{10} encodes 0.)

D = cell(10,1);
D{1}  = [0 0 1 0 0;...
         0 1 1 0 0;...
         0 0 1 0 0;...
         0 0 1 0 0;...
         0 0 1 0 0;...
         0 0 1 0 0;...
         0 1 1 1 0];

D{2} =  [0 1 1 1 0;...
         1 0 0 0 1;...
         0 0 0 0 1;...
         0 0 0 1 0;...
         0 0 1 0 0;...
         0 1 0 0 0;...
         1 1 1 1 1];

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D{10} = [0 1 1 1 0;...
         1 0 0 0 1;...
         1 0 0 0 1;...
         1 0 0 0 1;...
         1 0 0 0 1;...
         1 0 0 0 1;...
         0 1 1 1 0];
```

2 Challenge question

Refer to the question above. What if you have five extra-long-life light bulbs? Determine in which positions you should place these special light bulbs in the two cases described above.