TASK 2.3. CODES

We define the distance $d_H(X, Y)$ between two strings X and Y of equal length to be the usual Hamming distance, i.e. the number of positions in which X and Y differ.

For example, $d_H($`1001`, `0010`$)=3$ and $d_H($`1001111`, `0010101`$)=4$.

Let $n \geq 1$ and suppose $C = W_1, W_2, \ldots, W_M$ is a list of M binary strings of length n.

We consider C as a circular list and define the distance $d_C(W_i, W_j)$ between two strings W_i and W_j in the list as $d_C(W_i, W_j) = \min\{\text{abs}(i-j), M-\text{abs}(i-j)\}$.

Suppose k satisfies $1 \leq k < n$. We say that C is a ***circular code*** of ***length*** n and ***spread*** k if for every i, j, $1 \leq i, j \leq M$ the following hold

(1) If $d_C(W_i, W_j) \leq k$, then $d_H(W_i, W_j) = d_C(W_i, W_j)$;

(2) If $d_C(W_i, W_j) > k$, then $d_H(W_i, W_j) > k$.

A central problem in the study of circular codes is to determine the maximum number of strings in a circular code of length n and spread k. The exact value of this number is known only for some small values of parameters n and k. Your task is for a given pair n, k to construct a circular code containing as many as possible strings.

Test #	1	2	3	4	5	6	7	8	9	10
n	5	6	6	7	7	8	8	9	10	10
k	1	1	2	1	2	1	2	2	2	3

You have to submit 10 files containing your codes with parameters from the table above. Do not submit any program!

The first line of your file should contain

`#FILE code` *`t`*

where ***`t`*** is the test number.

The next M lines should contain the successive strings of the constructed code of length n and spread k.

For each test case, the best solutions among all competitors will get 10 points. If the best solution is a code with B strings, and you have submitted a correct solution with M strings your score will be $10M/B$. The score will be rounded to the first decimal digit for each case. The total score will be rounded to the nearest integer.

EXAMPLE

n=4, k=1, M=8

```
#FILE code 0
1101
1100
1110
1010
1011
0011
0001
0101
```