4664 Spam Detection

It is well-known that the number of occurrences of the term "free" can distinguish spam and nonspam emails. Your task is to build a spam detection module, based on the number of term "free" in an email.

The core of this detection module is a spam classifier, which is represented by two variables: *Low* and *High*. An email that contains X "free" words is classified by this module as a spam if $Low \leq X \leq High$, otherwise it is not.

To measure the goodness of a classifier, we introduce several information-retrieval terminologies:

		Actual	
		Spam	Non-Spam
Predicted	Spam	TP	FP
	Non-Spam	FN	TN

TP (true positive) is the number of emails which are truly predicted as spam; FN (false negative) is the number of emails which are wrongly predicted as non-spam, and so on.

The portion of emails that are correctly identified as spam is denoted as precision (P), which is formulated as $P = TP/(TP + FP)$. The portion of spam emails that are successfully identified is denoted as recall (R), which is formulated as $R = TP/(TP + FN)$. To balance between precision and recall, we use the F-measure which is formulated as $F = 2 \times P \times R/(P + R)$. For example, when $TP = 5$, $FP = 3$, $FN = 2$, $TN = 4$, we have $R = 5/7$, $P = 5/8$, and $F = 2/3$.

When there is no spam, we can report all emails as non-spam with $F = 1.0$ (perfect classifier).

Our data mining team has manually analyzed several emails and labeled them as spam or non-spam. Your task is to find the values of *Low* and *High* that yield the best classifier, i.e., the one that maximizes the F-measure.

Input

The input consists of several test cases, where each case contains of two lines:

- N : The maximum number of term "free" in any emails ($1 \leq N \leq 2 \times 10^6$)
- a_0 A B M : parameters of random number generator. ($2 \leq M \leq 10$; $0 \leq a_0, A, B < M$)

This random number generator generates a sequence of number:

$$a_i = (A * a_{i-1} + B) \bmod M \text{ for } i >= 1$$

Specifying:
$pos_i = a_{2i}$ ($0 \leq i \leq N$): the number of spam emails with i number of term "free".
$neg_i = a_{2i+1}$ ($0 \leq i \leq N$): the number of non-spam emails with i number of term "free".
The input is terminated by EOF.

Output

For each simulation print the F-measure of the best classifier (accurate to 6 decimal places).

Explanation for the 1st case:

This random number generator generates a sequence of $1, 2, 0, 1, 2, \ldots$. The number of spam emails is: $pos_i = \{1, 0, 2, 1\}$, and the number of non-spam emails is $neg_i = \{2, 1, 0, 2\}$.

The optimal classifier treats emails with number of term "free" between 2 and 3 as spam, with $R = 3/4$ and $P = 3/5$, resulting $F = 2/3$. Another way of producing optimal classifier is to consider emails with number of term "free" equals to 2 as spam.

Sample Input

```
3
1 1 1 3
5
2 3 4 5
```

Sample Output

```
0.666667
0.923077
```