A - Lucky 7

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 100 points

Problem Statement

Given is a three-digit integer N. Does N contain the digit 7?

If so, print `'Yes'`; otherwise, print `'No'`.

Constraints

- $100 \leq N \leq 999$

Input

Input is given from Standard Input in the following format:

N

Output

If N contains the digit 7, print `'Yes'`; otherwise, print `'No'`.

Sample Input 1

```
117
```

Sample Output 1

```
Yes
```

117 contains 7 as its last digit.

Sample Input 2

```
123
```

Sample Output 2

```
No
```

123 does not contain the digit 7.

Sample Input 3

```
777
```

Sample Output 3

```
Yes
```

B - FizzBuzz Sum

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 200 points

Problem Statement

Let us define the **FizzBuzz sequence** $a_1, a_2, \ldots$ as follows:

- If both 3 and 5 divides i, $a_i = \mathrm{FizzBuzz}$.
- If the above does not hold but 3 divides i, $a_i = \mathrm{Fizz}$.
- If none of the above holds but 5 divides i, $a_i = \mathrm{Buzz}$.
- If none of the above holds, $a_i = i$.

Find the sum of all numbers among the first N terms of the FizzBuzz sequence.

Constraints

- $1 \leq N \leq 10^6$

Input

Input is given from Standard Input in the following format:

N

Output

Print the sum of all numbers among the first N terms of the FizzBuzz sequence.

Sample Input 1

```
15
```

Sample Output 1

```
60
```

The first 15 terms of the FizzBuzz sequence are:

$1, 2, \mathrm{Fizz}, 4, \mathrm{Buzz}, \mathrm{Fizz}, 7, 8, \mathrm{Fizz}, \mathrm{Buzz}, 11, \mathrm{Fizz}, 13, 14, \mathrm{FizzBuzz}$

Among them, numbers are $1, 2, 4, 7, 8, 11, 13, 14$, and the sum of them is 60.

Sample Input 2

```
1000000
```

Sample Output 2

```
266666333332
```

Watch out for overflow.

C - Sum of gcd of Tuples (Easy)

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 300 points

Problem Statement

Find $\sum_{a=1}^{K}\sum_{b=1}^{K}\sum_{c=1}^{K}\gcd(a,b,c)$.

Here $\gcd(a,b,c)$ denotes the greatest common divisor of a, b, and c.

Constraints

- $1 \leq K \leq 200$
- K is an integer.

Input

Input is given from Standard Input in the following format:

K

Output

Print the value of $\sum_{a=1}^{K}\sum_{b=1}^{K}\sum_{c=1}^{K}\gcd(a,b,c)$.

Sample Input 1

2

Sample Output 1

9

$\gcd(1,1,1)+\gcd(1,1,2)+\gcd(1,2,1)+\gcd(1,2,2)$
$+\gcd(2,1,1)+\gcd(2,1,2)+\gcd(2,2,1)+\gcd(2,2,2)=1+1+1+1+1+1+1+2=9$

Thus, the answer is 9.

Sample Input 2

```
200
```

Sample Output 2

```
10813692
```

D - RGB Triplets

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 400 points

Problem Statement

We have a string S of length N consisting of `'R'`, `'G'`, and `'B'`.

Find the number of triples $(i,\ j,\ k)$ $(1 \leq i < j < k \leq N)$ that satisfy both of the following conditions:

- $S_i \neq S_j$, $S_i \neq S_k$, and $S_j \neq S_k$.
- $j - i \neq k - j$.

Constraints

- $1 \leq N \leq 4000$
- S is a string of length N consisting of `'R'`, `'G'`, and `'B'`.

Input

Input is given from Standard Input in the following format:

N
S

Output

Print the number of triplets in question.

Sample Input 1

```
4
RRGB
```

Sample Output 1

```
1
```

Only the triplet $(1,\ 3,\ 4)$ satisfies both conditions. The triplet $(2,\ 3,\ 4)$ satisfies the first condition but not the second, so it does not count.

Sample Input 2

```
39
RBRBGRBGGBBRRGBBRRRBGGBRBGBRBGBRBBBGBBB
```

Sample Output 2

```
1800
```

E - Sum of gcd of Tuples (Hard)

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 500 points

Problem Statement

Consider sequences $\{A_1, \ldots, A_N\}$ of length N consisting of integers between 1 and K (inclusive).

There are K^N such sequences. Find the sum of $\gcd(A_1, \ldots, A_N)$ over all of them.

Since this sum can be enormous, print the value modulo $(10^9 + 7)$.

Here $\gcd(A_1, \ldots, A_N)$ denotes the greatest common divisor of $A_1, \ldots, A_N$.

Constraints

- $2 \leq N \leq 10^5$
- $1 \leq K \leq 10^5$
- All values in input are integers.

Input

Input is given from Standard Input in the following format:

```
N K
```

Output

Print the sum of $\gcd(A_1, \ldots, A_N)$ over all K^N sequences, modulo $(10^9 + 7)$.

Sample Input 1

```
3 2
```

Sample Output 1

```
9
```

$\gcd(1,1,1) + \gcd(1,1,2) + \gcd(1,2,1) + \gcd(1,2,2)$
$+ \gcd(2,1,1) + \gcd(2,1,2) + \gcd(2,2,1) + \gcd(2,2,2) = 1 + 1 + 1 + 1 + 1 + 1 + 1 + 2 = 9$

Thus, the answer is 9.

Sample Input 2

```
3 200
```

Sample Output 2

```
10813692
```

Sample Input 3

```
100000 100000
```

Sample Output 3

```
742202979
```

Be sure to print the sum modulo $(10^9 + 7)$.

F - Select Half

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 600 points

Problem Statement

Given is an integer sequence $A_1, \ldots, A_N$ of length N.

We will choose exactly $\left\lfloor \frac{N}{2} \right\rfloor$ elements from this sequence so that no two adjacent elements are chosen.

Find the maximum possible sum of the chosen elements.

Here $\lfloor x \rfloor$ denotes the greatest integer not greater than x.

Constraints

- $2 \leq N \leq 2 \times 10^5$
- $|A_i| \leq 10^9$
- All values in input are integers.

Input

Input is given from Standard Input in the following format:

$$N$$
$$A_1 \quad \ldots \quad A_N$$

Output

Print the maximum possible sum of the chosen elements.

Sample Input 1

```
6
1 2 3 4 5 6
```

Sample Output 1

```
12
```

Choosing 2, 4, and 6 makes the sum 12, which is the maximum possible value.

Sample Input 2

```
5
-1000 -100 -10 0 10
```

Sample Output 2

```
0
```

Choosing -10 and 10 makes the sum 0, which is the maximum possible value.

Sample Input 3

```
10
1000000000 1000000000 1000000000 1000000000 1000000000 1000000000 1000000000 1000000000 100
0000000 1000000000
```

Sample Output 3

```
5000000000
```

Watch out for overflow.

Sample Input 4

```
27
18 -28 18 28 -45 90 -45 23 -53 60 28 -74 -71 35 -26 -62 49 -77 57 24 -70 -93 69 -99 59 57 -
49
```

Sample Output 4

```
295
```