week:12-01-User Defined Functions

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Q1)problem statement:

A binary number is a combination of 1s and 0s. Its nth least significant digit is the nth digit starting from the right starting with 1. Given a decimal number, convert it to binary and determine the value of the 4th least significant digit.

Example

number = 23

Convert the decimal number 23 to binary number: $23_{10} = 2_4 + 2_2 + 2_1 + 2_0 = (10111)_2$.

The value of the 4th index from the right in the binary representation is 0.

Function Description

Complete the function fourthBit in the editor below.

fourthBit has the following parameter(s):

int number: a decimal integer

Returns:

int: an integer 0 or 1 matching the 4th least significant digit in the binary representation of number.

Constraints

 $0 \le number < 231$

Input Format for Custom Testing

Input from stdin will be processed as follows and passed to the function.

The only line contains an integer, number.

Sample Case 0

Sample Input 0

STDIN Function

 $32 \rightarrow number = 32$

Sample Output 0

0

Explanation 0

Convert the decimal number 32 to binary number: 3210 = (100000)2.

The value of the 4th index from the right in the binary representation is 0.

Sample Case 1

Sample Input 1

STDIN Function

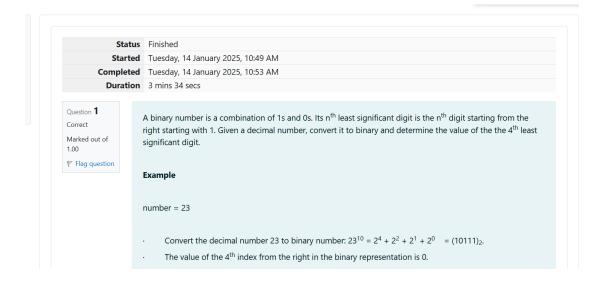
77 \rightarrow number = 77

Sample Output 1

1

Explanation 1

Convert the decimal number 77 to binary number: $77_{10} = (1001101)_2$. The value of the 4th index from the right in the binary representation is 1.



```
int fourthBit(int number)
 8
 9 ,
10
    int binary[32];
11
    int i=0;
12
13
    while(number>0)
14
15 ₹ {
        binary[i]=number%2;
16
        number/=2;
17
        i++;
18
19
20
    if(i>=4)
21 🔻
        return binary[3];
22
23
24
    else
25
    return 0;
26
```

	Test	Expected	Got	
~	<pre>printf("%d", fourthBit(32))</pre>	0	0	~
~	<pre>printf("%d", fourthBit(77))</pre>	1	1	~

Q2)problem statement:

Determine the factors of a number (i.e., all positive integer values that evenly divide into a number) and then return the pth element of the list, sorted ascending. If there is no pth element, return 0. Example

n = 20

p = 3

The factors of 20 in ascending order are $\{1, 2, 4, 5, 10, 20\}$. Using 1-based indexing, if p = 3, then 4 is returned. If p > 6, 0 would be returned.

Function Description

Complete the function pthFactor in the editor below.

pthFactor has the following parameter(s):

int n: the integer whose factors are to be found

int p: the index of the factor to be returned

Returns:

int: the long integer value of the pth integer factor of n or, if there is no factor at that index, then 0

is returned

constraints

 $1 \le n \le 10$ ₁₅

 $1 \le p \le 109$

Input Format for Custom Testing

Input from stdin will be processed as follows and passed to the function.

The first line contains an integer n, the number to factor.

The second line contains an integer p, the 1-based index of the factor to return.

Sample Case 0

Sample Input 0

STDIN Function

 $10 \rightarrow n = 10$

 $3 \rightarrow p = 3$

Sample Output 0

5

Explanation 0

Factoring n = 10 results in $\{1, 2, 5, 10\}$. Return the p = 3rd factor, 5, as the answer.

Sample Case 1

Sample Input 1

STDIN Function

 $10 \rightarrow n = 10$

 $5 \rightarrow p = 5$

Sample Output 1

Explanation 1

Factoring n = 10 results in $\{1, 2, 5, 10\}$. There are only 4 factors and p = 5, therefore 0 is returned as the answer.

Sample Case 2

Sample Input 2

STDIN Function

 $1 \rightarrow n = 1$

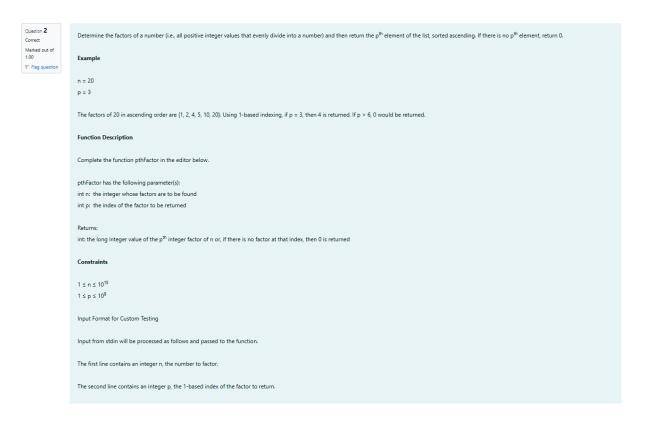
 $1 \rightarrow p = 1$

Sample Output 2

1

Explanation 2

Factoring n = 1 results in $\{1\}$. The p = 1st factor of 1 is returned as the answer.



```
10
    long pthFactor(long n, long p)
11 🔻 {
12 int count =0;
13 | for(long i=1;i<=n;i++)
14 v {
        if(n%i==0)
15
16 ₹
17
            count++;
18
            if(count==p)
19 v
                return i;
20
            }
21
22
23
24
    return 0;
25 }
```

	Test	Expected	Got	
~	<pre>printf("%ld", pthFactor(10, 3))</pre>	5	5	~
~	<pre>printf("%ld", pthFactor(10, 5))</pre>	0	0	~
~	<pre>printf("%ld", pthFactor(1, 1))</pre>	1	1	~

week:12-02

Roll no:241501091

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Q1)problem statement:

You are a bank account hacker. Initially you have 1 rupee in your account, and you want exactly *N* rupees in your account. You wrote two hacks, first hack can multiply the amount of money you own by 10, while the second can multiply it by 20. These hacks can be used any number of time. Can you achieve the desired amount *N* using these hacks.

Constraints:

1<=T<=100

1<=N<=10^12

Input

The test case contains a single integer N.

Output

For each test case, print a single line containing the string "1" if you can make exactly N rupees or "0" otherwise.

SAMPLE INPUT

```
SAMPLE OUTPUT
SAMPLE INPUT
SAMPLE OUTPUT
```

```
Status Finished
            Started Tuesday, 14 January 2025, 10:55 AM
        Completed Tuesday, 14 January 2025, 11:02 AM
          Duration 6 mins 58 secs
Question 1
                    You are a bank account hacker. Initially you have 1 rupee in your account, and you want exactly {\it N} rupees in
Correct
                    your account. You wrote two hacks, first hack can multiply the amount of money you own by 10, while the
Marked out of
                    second can multiply it by 20. These hacks can be used any number of time. Can you achieve the desired
1.00
                    amount {\it N} using these hacks.

▼ Flag question

                    Constraints:
                    1<=T<=100
                    1<=N<=10^12
                    Input
                          The test case contains a single integer N.
```

```
int myFunc(int n)
8
9 🔻
    {
10
     while(n>1)
11 v
     {
12
          if(n%200==0)
13 🔻
14
              n/=200;
15
          else if(n%20==0)
16
17
              n/=<mark>20;</mark>
18
19
20
          else if(n%10==0)
21 🔻
22
              n/=10;
23
          }
24
          else
25
          {
26
               return 0;
27
28
29
     return (n==1);
30
    }
31
```

("%d", myFunc(1))	1	1	~
("%d", myFunc(2))	0	0	~
("%d", myFunc(10))	1	1	~
("%d", myFunc(25))	0	0	~
("%d", myFunc(200))	1	1	~
	f("%d", myFunc(2)) f("%d", myFunc(10)) f("%d", myFunc(25))	F("%d", myFunc(2)) 0 F("%d", myFunc(10)) 1	F("%d", myFunc(2)) 0 0 0 F("%d", myFunc(10)) 1 1 1 F("%d", myFunc(25)) 0 0

Q2)problem statement:

Find the number of ways that a given integer, X, can be expressed as the sum of the Nth powers of unique, natural numbers.

For example, if X = 13 and N = 2, we have to find all combinations of unique squares adding up to 13. The only solution is 22 + 32.

Function Description

Complete the powerSum function in the editor below. It should return an integer that represents the number of possible combinations.

powerSum has the following parameter(s):

X: the integer to sum to

N: the integer power to raise numbers to

Input Format

The first line contains an integer X.

The second line contains an integer N.

Constraints

 $1 \le X \le 1000$

 $2 \le N \le 10$

Output Format

Output a single integer, the number of possible combinations calculated.

Sample Input 0

10

2

Sample Output 0

1

Explanation 0

If X = 10 and N = 2, we need to find the number of ways that 10 can be represented as the sum of squares of unique numbers.

10 = 12 + 32

This is the only way in which 10 can be expressed as the sum of unique squares.

Sample Input 1

```
100
2
Sample Output 1
Explanation 1
100 = (102) = (62 + 82) = (12 + 32 + 42 + 52 + 72)
Sample Input 2
100
3
Sample Output 2
Explanation 2
100 can be expressed as the sum of the cubes of 1, 2, 3, 4.
```

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(1 + 8 + 27 + 64 = 100). There is no other way to express 100 as the sum of cubes. Find the number of ways that a given integer, \mathbf{X} , can be expressed as the sum of the \mathbf{N}^{th} powers of unique, natural numbers. For example, if X = 13 and N = 2, we have to find all combinations of unique squares adding up to 13. The only solution is $2^2 + 3^2$. ♥ Flag question **Function Description** Complete the powerSum function in the editor below. It should return an integer that represents the number of possible combinations. powerSum has the following parameter(s): X: the integer to sum to N: the integer power to raise numbers to Input Format The first line contains an integer $\emph{\textbf{X}}$. The second line contains an integer N. 1 ≤ X ≤ 1000 2 ≤ N ≤ 10 **Output Format** Output a single integer, the number of possible combinations calculated. Sample Input 0 Sample Output 0

```
9
   #include<stdio.h>
10
   #include<math.h>
   int powerSum(int x, int m, int n)
11
12 ₹ {
13
        int c=0;
14
        int limit=(int)pow(x,1.0/n);
15
        int totalCombination=1<<li>init;
16
        for(int mask=0; mask<totalCombination; mask++)</pre>
17 🔻
18
            int sum=0;
19
            for(int j=1;j<=limit;j++)</pre>
20 1
21
               if(mask&(1<<(j-1)))
22 🔻
23
                   sum+=(int)pow(j,n);
24
               }
25
26
           if(sum==x)
27 ▼
           {
28
               c++;
29
30
31
        return c;
32
33 }
```

