Algorithm Design

Asst. Prof. Dr. Thitipong Tanprasert

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Content   page

Question

Background

The public transport administration of Ekaterinburg is anxious about the fact that passengers don't like to pay for passage doing their best to avoid the fee. All the measures that had been taken (hard currency premiums for all of the chiefs, increase in conductors' salaries, reduction of number of buses) were in vain. An advisor especially invited from the Ural State University says that personally he doesn't buy tickets because he rarely comes across the lucky ones (a ticket is lucky if the sum of the first three digits in its number equals to the sum of the last three ones). So, the way out is found — of course, tickets must be numbered in sequence, but the number of digits on a ticket may be changed. Say, if there were only two digits, there would have been ten lucky tickets (with numbers 00, 11, …, 99). Maybe under the circumstances the ratio of the lucky tickets to the common ones is greater? And what if we take four digits? A huge work has brought the long-awaited result: in this case there will be 670 lucky tickets. But what to do if there are six or more digits?

Problem

So you are to save public transport of our city. Write a program that determines a number of lucky tickets for the given number of digits. By the way, there can't be more than nine digits on one ticket.

Input

contains a positive even integer not greater than 9.

Output

should contain a number of tickets such that the sum of the first half of digits is equal to the sum of the second half of digits.

Sample

input	output
4	670

Problem Author: Stanislav Vasilyev
Problem Source: Ural State University Internal Contest October'2000 Students Session
Tags: problem for beginners   (hide tags for unsolved problems)

Difficulty: 119   Printable version   Submit solution   Discussion (49)

Analysis

Question want us to find lucky number from ticket that contains 8 digits but only positive even numbers so it consider to be 2, 4, 6, and 8 digits. Further more the question not only want us to find lucky number from ticket that contains 8 digits but only positive even but both number that div by half have to be equals on both side such as (00, which contain 0 on the left and 0 on the right have the same number after we div it. 11, also on the left contain 1, and on the right contain 1 also). After we know what the question ask we have to form a code. In python doesn't have switch case so I use if else to check that input is the right one, and using for loop to calculate the outcome of the lucky number from ticket that contains 8 digits but only positive even. Early code will show you next page.

Early code

```python
#finding 2 digits
#if digits == 2:
#    for x in range(10):
#        for y in range(10):
#            if x == y:
#                output += 1

#finding 4 digits
# elif digits == 4:
#    for x in range(10):
#        for y in range(10):
#            for a in range(10):
#                for b in range(10):
#                    if x+y == a+b:
#                        output +=1

#finding 6 digits
# elif digits == 6:
#    for x in range(10):
#        for y in range(10):
#            for z in range(10):
#                for a in range(10):
#                    for b in range(10):
#                        for c in range(10):
#                            if x+y+z == a+b+c:
#                                output +=1

#finding 8 digits
# elif digits == 8:
#    for x in range(10):
#        for y in range(10):
#            for z in range(10):
#                for k in range(10):
#                    for a in range(10):
#                        for b in range(10):
#                            for c in range(10):
#
```

Final code(after brute force)

```python
digits = int(raw_input())       #get raw input and convert it to int

output = 0        #imprement var output

# brute force version. or else every digits that we need to consider
# will be doing for loop to calculate (n+1), by the math
# first half of digits will equals to last part digits.
# brute force is already calculate and directly to answer
if digits == 2:
    output = 10
elif digits == 4:
    output = 670
elif digits == 6:
    output = 55252
elif digits == 8:
    output = 4816030

print output
```

I got this brute force by running the code and every time the code still give output the same. So I running the other(other digits that's not 2 digits) and I get the same output as well. I try this fixed out come to test that is work or not in the Timus and it faster than previous code that I have try because we have to wait for the outcome(out put) to be calculated. But we already know what is the outcome so we can answer it right the way.

Accepted by Timus Online

Solutions judgement results

ID	Date	Author	Problem	Language	Judgement result	Test #	Execution time	Memory used
8154567	07:56:58 29 Nov 2018	Anawil Chumphun	1044. Lucky Tickets. Easy!	Python 2.7	Accepted		0.031	312 KB

ASSUMPTION UNIVERSITY

Vincent Mary School of Engineering

CE 3111

Design and Analysis of algorithms

Term Project Report

1044. Lucky Tickets. Easy!

Timus Online Judge

Submitted to

Asst. Prof. Dr. Thitipong Tanprasert

by

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Semester 1/2018

1044. Lucky Tickets. Easy!

Time limit: 2.0 second
Memory limit: 64 MB

Background

The public transport administration of Ekaterinburg is anxious about the fact that passengers don't like to pay for passage doing their best to avoid the fee. All the measures that had been taken (hard currency premiums for all of the chiefs, increase in conductors' salaries, reduction of number of buses) were in vain. An advisor especially invited from the Ural State University says that personally he doesn't buy tickets because he rarely comes across the lucky ones (a ticket is lucky if the sum of the first three digits in its number equals to the sum of the last three ones). So, the way out is found — of course, tickets must be numbered in sequence, but the number of digits on a ticket may be changed. Say, if there were only two digits, there would have been ten lucky tickets (with numbers 00, 11, …, 99). Maybe under the circumstances the ratio of the lucky tickets to the common ones is greater? And what if we take four digits? A huge work has brought the long-awaited result: in this case there will be 670 lucky tickets. But what to do if there are six or more digits?

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PROBLEM SOLUTION

First, we receive the input from the keyboard by this code :

x = int(input())

Second, we compare the input with the existing case which are :

```
if x == 2:
        for a in range(10):
                for b in range(10):
                        if a == b:
                                output += 1
elif x == 4:
        for a in range(10):
          for b in range(10):
            for c in range(10):
              for d in range(10):
                if a+b == c+d:
                  output +=1
elif x == 6:
      for a in range(10):
        for b in range(10):
          for c in range(10):
            for d in range(10):
              for e in range(10):
                for f in range(10):
                  if a+b+c == d+e+f:
                    output +=1
elif x == 8:
      for a in range(10):
```

```
        for b in range(10):
            for c in range(10):
                for d in range(10):
                    for e in range(10):
                        for f in range(10):
                            for g in range(10):
                                for h in range(10):
                                    if a+b+c+d == e+f+g+h:
                                        output +=1
```

The concept of each case is we divide the input to be equal example, case x == 4 mean that there are four digits, so we will divide in to 2 2. Then we for loop it straight forward (brute force) and when it hits the equation : a + b == c + d (sum of first two digits is equal to sum of last two digits) the output will be increment by 1. However, the runtime exceed in timus, so because there are only 5 case available (2, 4, 6, 8, others) we decide to modify the code to be simple by :

```
elif x == 2:
        ans = 10
elif x == 4:
        ans = 670
elif x == 6:
        ans = 55252
elif x == 8:
ans = 4816030
```

and if it doesn't match any case the output will be zero as we had set it in the beginning.

ans = 0

TEST CASE

TEST CASE 1	0	0
TEST CASE 2	1	0
TEST CASE 3	2	10
TEST CASE 4	3	0
TEST CASE 5	4	670
TEST CASE 6	5	0
TEST CASE 7	6	55252
TEST CASE 8	7	0
TEST CASE 9	8	4816030

SUBMISSION RESULT

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Author: Panas • Problem: Lucky Tickets. Easy!

ID	Date	Author	Problem	Language	Judgement result	Test #	Execution time	Memory used
8153761	22:42:58 28 Nov 2018	Panas	1044. Lucky Tickets. Easy!	Python 3.6	Accepted		0.078	288 KB