



链滴

Amicable numbers

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来源网站: [链滴](#)

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Project Euler 第 21 题

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Question

Let $d(n)$ be defined as the sum of proper divisors of n (numbers less than n which divide evenly into n).

If $d(a) = b$ and $d(b) = a$, where $a \neq b$, then a and b are an amicable pair and each of a and b are called amicable numbers.

For example, the proper divisors of 220 are 1, 2, 4, 5, 10, 11, 20, 22, 44, 55 and 110; therefore $d(220) = 284$. The proper divisors of 284 are 1, 2, 4, 71 and 142; so $d(284) = 220$.

Evaluate the sum of all the amicable numbers under 10000.

Analysis

1. 因子求和函数应该怎样优化?
2. 字典来保存计算结果。
3. [官方思路](#)

Program

```
from math import sqrt, ceil
```

```
def get_sum(num):
```

```
sum = 1
mid = sqrt(num)
for factor in range(2, ceil(mid) + 1):
    if num % factor == 0:
        sum += factor
        if factor != mid:
            sum += num // factor

return sum
```

```
max_size = 10000
result = 0
cal = {}

for i in range(1, max_size):
    if cal.__contains__(i):
        a = cal[i]
    else:
        a = get_sum(i)
        cal[i] = a

    if cal.__contains__(a):
        b = cal[a]
    else:
        b = get_sum(a)
        cal[a] = b

    if i == b and i != a:
        result += i

print(result)
```