

# Euler problem 46

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# 本期内容

一. 题目讲解

二. 代码演示

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Goldbach's other conjecture

It was proposed by Christian Goldbach that every odd composite number can be written as the sum of a prime and twice a square.

$$9 = 7 + 2 \times 1^2$$

$$15 = 7 + 2 \times 2^2$$

$$21 = 3 + 2 \times 3^2$$

$$25 = 7 + 2 \times 3^2$$

$$27 = 19 + 2 \times 2^2$$

$$33 = 31 + 2 \times 1^2$$

It turns out that the conjecture was false.

What is the smallest odd composite that cannot be written as the sum of a prime and twice a square?

# 一. 题目讲解

哥德巴赫的另一个猜想

克里斯蒂安·哥德巴赫曾经猜想，每个奇合数都可以写成一个素数和一个平方的两倍之和。

$$9 = 7 + 2 \times 1^2$$

$$15 = 7 + 2 \times 2^2$$

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最终这个猜想被推翻了。

不能写成一个素数和一个平方的两倍之和的最小奇合数是多少？

# 一. 题目讲解

- 1、根据题目描述，所有素数都不需要判断，所以先把素数排除在外
- 2、同理，将所有偶数排除在外
- 3、模拟素数筛的标记过程，使用素数去标记掉范围内所有满足条件的数字

## 二. 代码演示

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```
#include <stdio.h>
#define MAX_N 1000000

int prime[MAX_N + 5] = {0};
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void init_prime() {
    for (int i = 2; i <= MAX_N; i++) {
        if (!prime[i]) {
            prime[++prime[0]] = i;
            a[i] = 1;
        }
        for (int j = 1; j <= prime[0]; j++) {
            if (i * prime[j] > MAX_N) break;
            prime[prime[j] * i] = 1;
            if (i % prime[j] == 0) break;
        }
    }
    return ;
}
```

```
int main() {
    init_prime();
    for (int i = 1; i <= prime[0]; i++) {
        for (int n = 1; ; n++) {
            if (prime[i] + 2 * n * n > MAX_N) break;
            a[prime[i] + 2 * n * n] = 1;
        }
    }
    for (int i = 9; i <= MAX_N; i += 2) {
        if (a[i]) continue;
        printf("%d\n", i);
        break;
    }
    return 0;
}
```