Project Euler #228: Minkowski Sums

This problem is a programming version of Problem 228 from projecteuler.net

Let S_n be the regular n-sided polygon – or shape – whose vertices v_k $(k = 1, 2, \ldots, n)$ have coordinates:

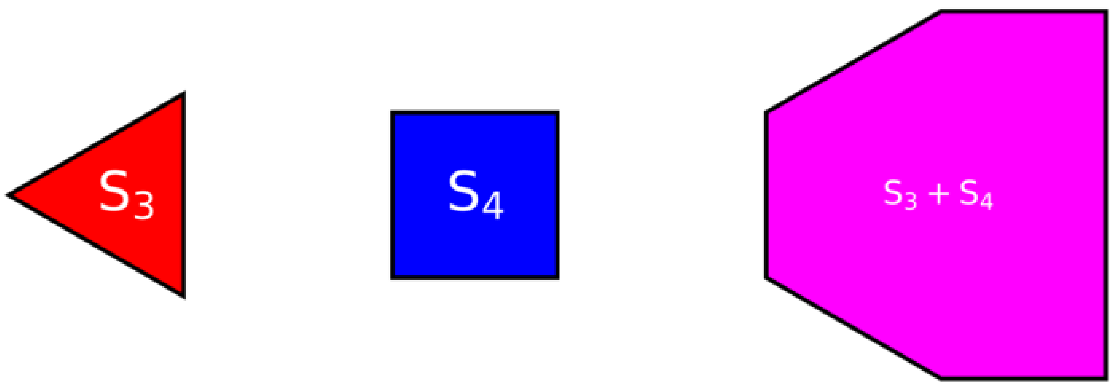
$$x_k = \cos\left(\frac{(2k-1)\pi}{n}\right)$$

$$y_k = \sin\left(\frac{(2k-1)\pi}{n}\right)$$

Each S_n is to be interpreted as a filled shape consisting of all points on the perimeter and in the interior.

The Minkowski sum, $S + T$, of two shapes S and T is the result of adding every point in S to every point in T, where point addition is performed coordinate-wise: $(u,\ v) + (x,\ y) = (u + x,\ v + y)$.

For example, the sum of S_3 and S_4 is the six-sided shape shown in pink below:



Given two integers L and R, how many sides does the Minkowski sum $\sum_{i=L}^{R} S_i$ have?

Input Format

The first line of each test file contains a single integer q which is the number of queries.
Each of the next q lines contains two space-separated integers, L and R.

Constraints

- $1 \le q \le 10^4$.
- $3 \le L \le R$.
- The sum of R over all queries $\le 4 \times 10^{10}$.

Output Format

Print the answer to each query in a new line.

Sample Input 0

```
1
3 4
```

Sample Output 0

```
6
```

Explanation 0

The figure in the problem description shows $S_3 + S_4$.
We can see that the number of sides of that shape is 6.

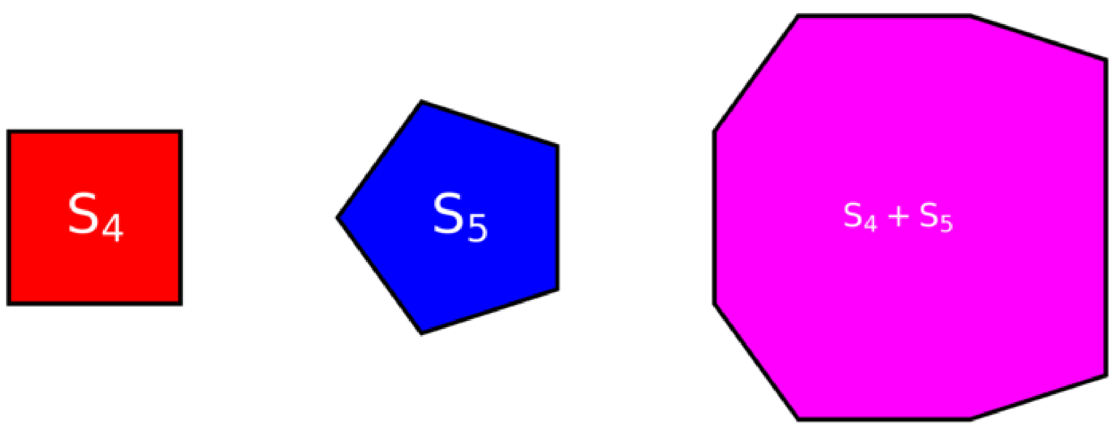
Sample Input 1

```
1
4 5
```

Sample Output 1

```
8
```

Explanation 1



Sample Input 2

```
1
3 5
```

Sample Output 2

```
10
```

Explanation 2