

Jockey Club

2020 Apr 29

Question 1

Find the sum of all 3 multiples together with all 5 multiples under 1000. Can you do that in O(1)?

Answer

It is given by an analytic solution :

```
int N0 = floor(1000/3);
int N1 = floor(1000/5);
int N2 = floor(1000/15);
int answer = (N0*(N0+1)/2) * 3 + (N1*(N1+1)/2) * 5 - (N2*(N2+1)/2) * 15;
```

Question 2

Consider sudden death (突然死亡) in soccer, if the goal rate of team A is p_A and that of team B is p_B what is the probability of team A winning finally?

Answer

Team A wins only if it goals while team B does not. Otherwise sudden death continues.

$$\begin{aligned}\text{Answer} &= p_A(1-p_B) + [p_A p_B + (1+p_A)(1+p_B)] p_A(1-p_B) + [p_A p_B + (1+p_A)(1+p_B)]^2 p_A(1-p_B) + \dots \\ &= p_A(1-p_B) \times [1 + [p_A p_B + (1+p_A)(1+p_B)] + [p_A p_B + (1+p_A)(1+p_B)]^2 + \dots] \\ &= \frac{p_A(1-p_B)}{1 - [p_A p_B + (1+p_A)(1+p_B)]}\end{aligned}$$