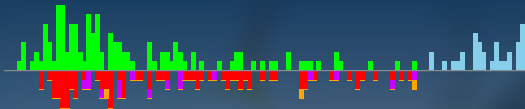


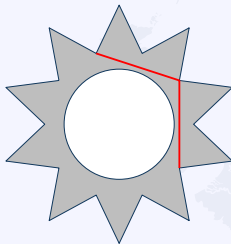
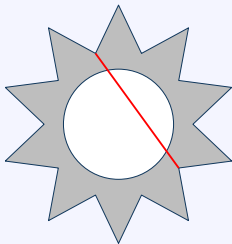
Problem

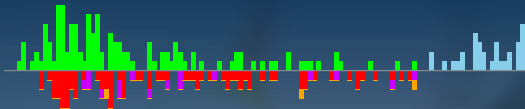
Wrap yarn around a wheel with n notches, by taking steps of k notches each time.
Given n , what value of k maximizes the amount of yarn used?



Observations

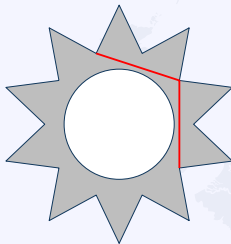
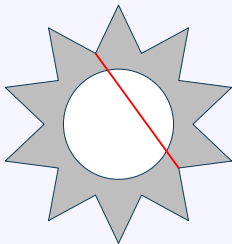
- If $\gcd(k, n) > 1$, then replacing k by $\frac{k}{\gcd(k, n)}$ increases the length.

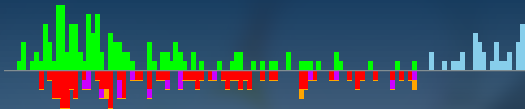




Observations

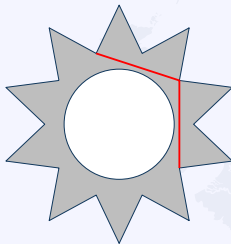
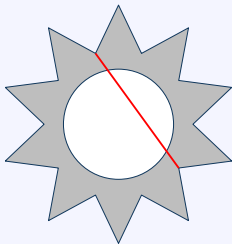
- If $\gcd(k, n) > 1$, then replacing k by $\frac{k}{\gcd(k, n)}$ increases the length.
- If $\gcd(k, n) = 1$, then the total length is $n \cdot (\text{length of single chord})$, which is maximized when k is as close to $\frac{n}{2}$ as possible.

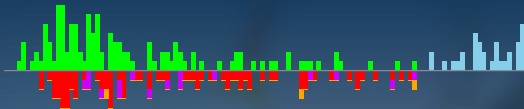




Observations

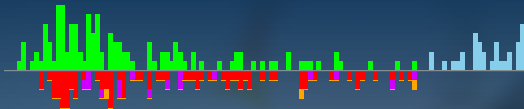
- If $\gcd(k, n) > 1$, then replacing k by $\frac{k}{\gcd(k, n)}$ increases the length.
- If $\gcd(k, n) = 1$, then the total length is $n \cdot (\text{length of single chord})$, which is maximized when k is as close to $\frac{n}{2}$ as possible.
- Need to find k coprime with n which is as close to $\frac{n}{2}$ as possible.





Observation

Need to find k coprime with n which is as close to $\frac{n}{2}$ as possible.

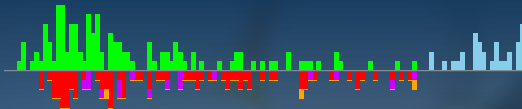


Observation

Need to find k coprime with n which is as close to $\frac{n}{2}$ as possible.

Solution

- Can use linear search, starting from $\frac{n}{2}$.

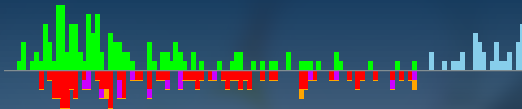


Observation

Need to find k coprime with n which is as close to $\frac{n}{2}$ as possible.

Solution

- Can use linear search, starting from $\frac{n}{2}$.
- Alternatively, use a direct formula:
 - if $n \equiv 1 \pmod 2$, take $k = \frac{n-1}{2}$,
 - if $n \equiv 2 \pmod 4$, take $k = \frac{n}{2} - 2$,
 - if $n \equiv 0 \pmod 4$, take $k = \frac{n}{2} - 1$.



Observation

Need to find k coprime with n which is as close to $\frac{n}{2}$ as possible.

Solution

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Statistics: 248 submissions, 119 accepted, 32 unknown