



# USACO for College Application and Job Interview

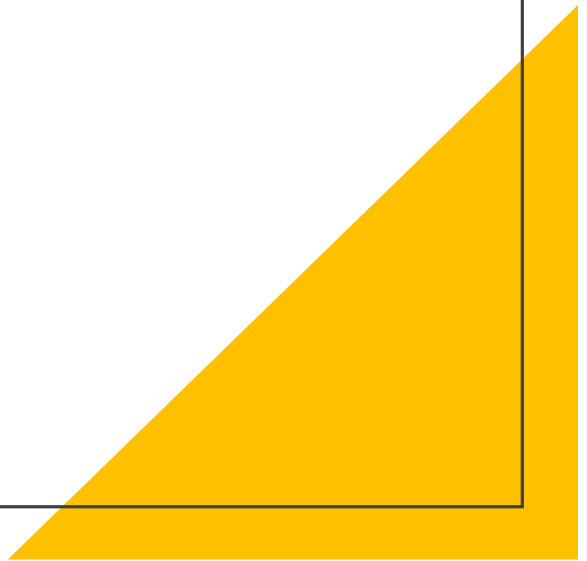
Sugar Land, TX

May 14, 2022



# USACO for College Application and Job Interview

- USACO竞赛
- USACO和大学申请
- USACO和工作面试



# USACO竞赛

USACO 奥林匹克信息学竞赛：算法设计与编程

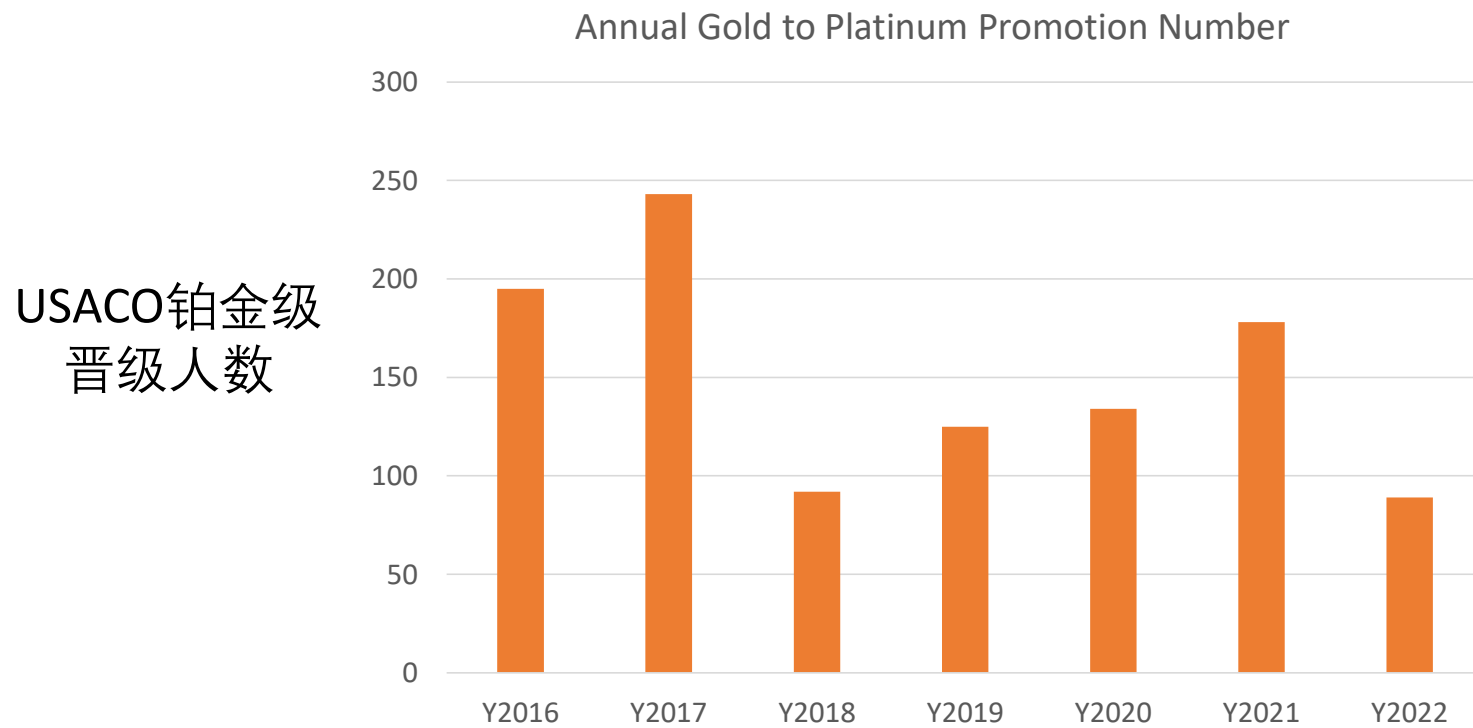
Levels:

- Bronze
- Silver
- Gold
- Platinum

Four rounds per season:

- December
- January
- February
- March/April (US Open)

# USACO竞赛



# USACO竞赛

竞赛级别	覆盖内容
Bronze – Silver	基本编程工具; 竞赛编程技巧
Silver – Gold	常用数据结构、算法
Gold -- Platinum	图论; 复杂数据结构、算法
Platinum – Camp/Team USA	离散数学; 复杂图论

# USACO和大学申请

## MIT Computer Science

### Introduction to Algorithms

Introduction to mathematical modeling of computational problems, as well as common algorithms, algorithmic paradigms, and data structures used to solve these problems. ...

### Mathematics for Computer Science

Elementary discrete mathematics for science and engineering, with a focus on mathematical tools and proof techniques useful in computer science. ...

### Design and Analysis of Algorithms

Techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice. Topics include sorting; search trees, heaps, and hashing; divide-and-conquer; dynamic programming; greedy algorithms; amortized analysis; graph algorithms; and shortest paths. ...

.....

# USACO和大学申请

## Princeton Computer Science

### Algorithms and Data Structures

This course surveys the most important algorithms and data structures in use on computers today. Particular emphasis is given to algorithms for sorting, searching, graphs, and strings.

### Introduction to Graph Theory

The fundamental theorems and algorithms of graph theory. Topics include connectivity, matchings, graph coloring, planarity, the four-color theorem, extremal problems, network flows, and related algorithms.

### Algorithms for Computational Biology

This course introduces algorithms for analyzing DNA, RNA, and protein, the three fundamental molecules in the cell. Students will learn algorithms on strings, trees, and graphs and their applications...

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# USACO和大学申请

## CMU Machine Learning

### Core courses

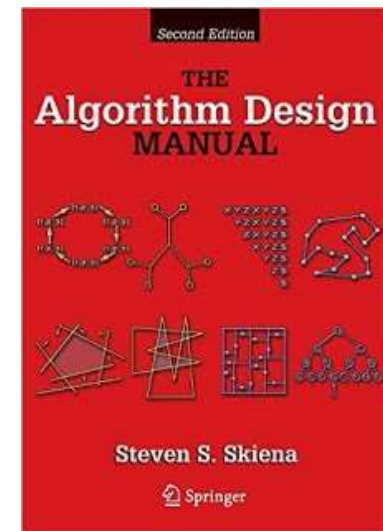
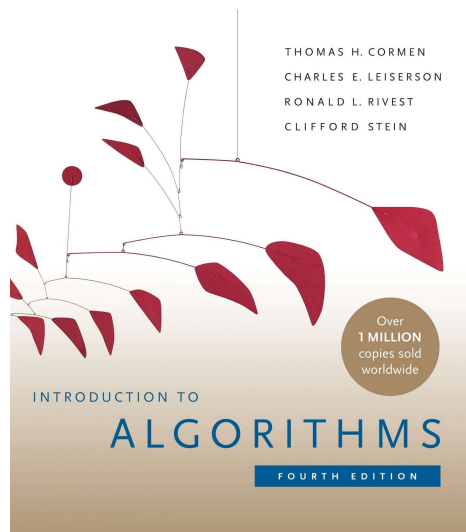
- Introduction to Machine Learning
- Intermediate Deep Learning
- Probabilistic Graphical Models
- Machine Learning in Practice
- Convex Optimization
- Probability & Mathematical Statistics

### Elective courses

- Machine Learning with Large Datasets
- Deep Reinforcement Learning
- Advanced Machine Learning: Theory and Methods
- Algorithms for NLP
- Machine Learning for Text Mining
- Neural Networks for NLP
- Multimodal Machine Learning
- Algorithms
- .....

# USACO和大学申请

## Textbooks for Algorithm



# USACO和工作面试

For a typical interview process:

After online assessment and phone screening

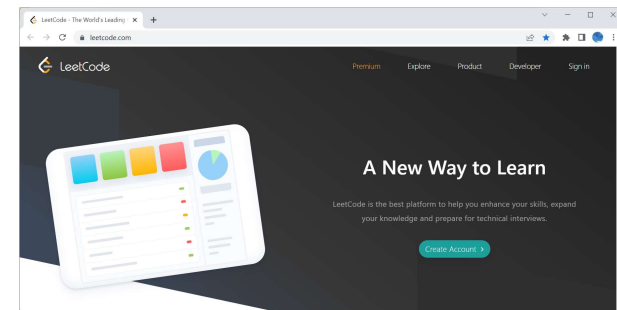
- four to six onsite interviews
- about 45 min to 60 min for each interview
- three or four interviews include coding questions

# USACO和工作面试

## Top companies

Amazon  
Microsoft  
Apple  
Adobe  
Oracle  
Goldman Sachs  
LinkedIn  
Yahoo  
Tiktok  
Walmart Global Tech  
.....

Google  
Facebook  
Bloomberg  
Uber  
ByteDance  
eBay  
VMware  
Salesforce  
Snapchat  
Twitter



# USACO和工作面试

## Topics

Array

Hash Table

Math

Depth-First Search

Database

Tree

Matrix

Two Pointers

Stack

Priority Queue

.....

String

Dynamic Programming

Sorting

Greedy

Breadth-First Search

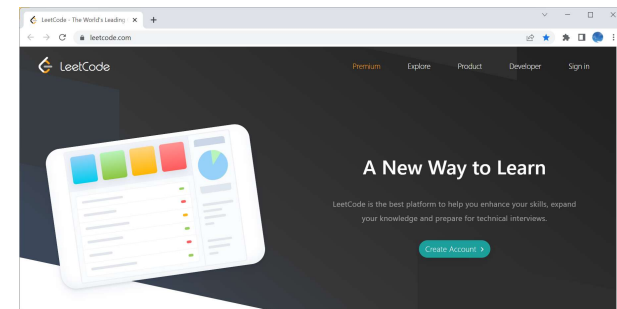
Binary Search

Binary Tree

Bit Manipulation

Design

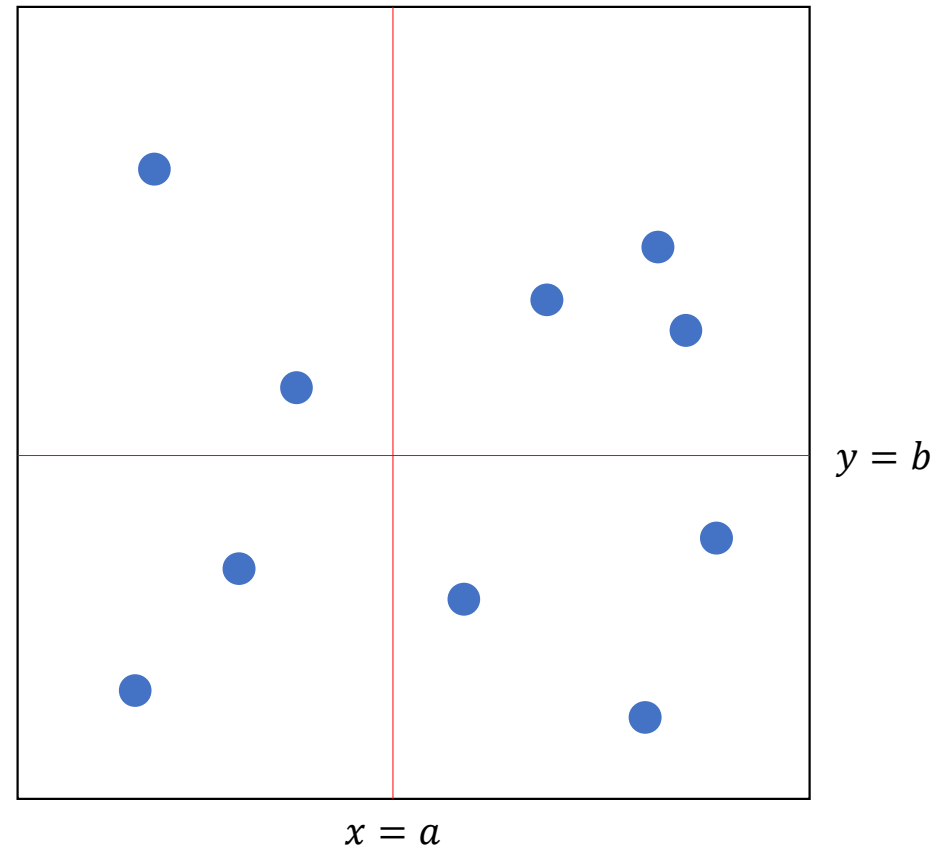
Graph



# USACO和工作面试

## Example 1: Load Balancing

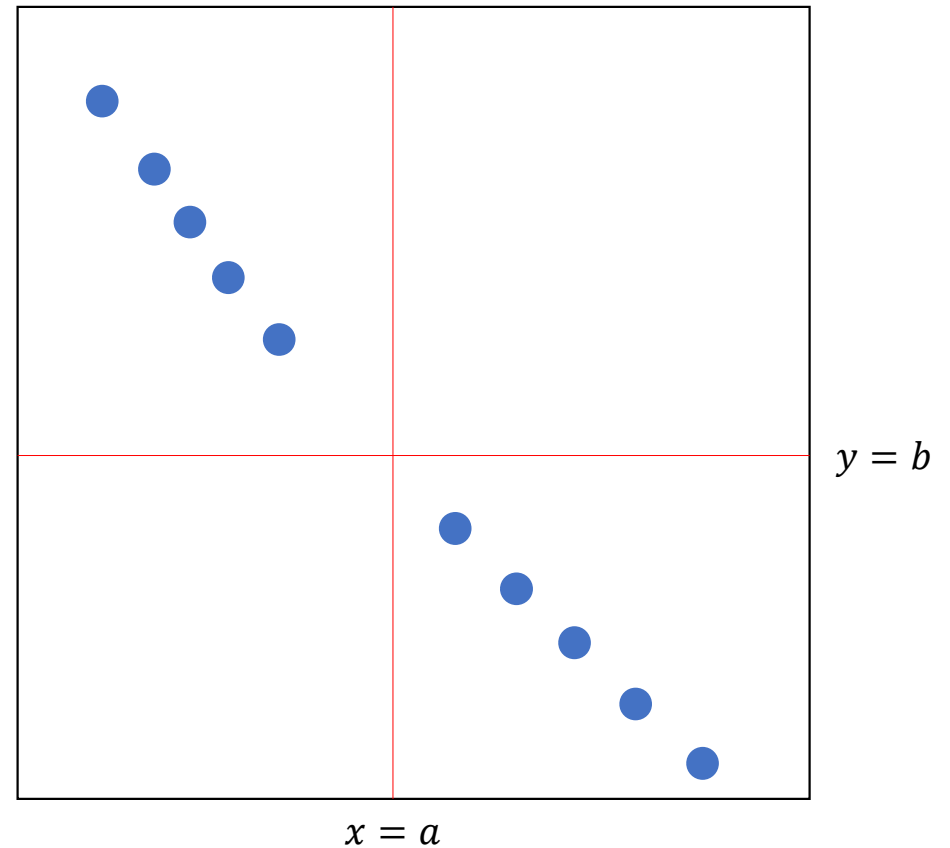
Given  $N$  cows, partition them in four regions so that the counts in four regions are as close as possible.



# USACO和工作面试

## Example 1: Load Balancing

Given  $N$  cows, partition them in four regions so that the counts in four regions are as close as possible.



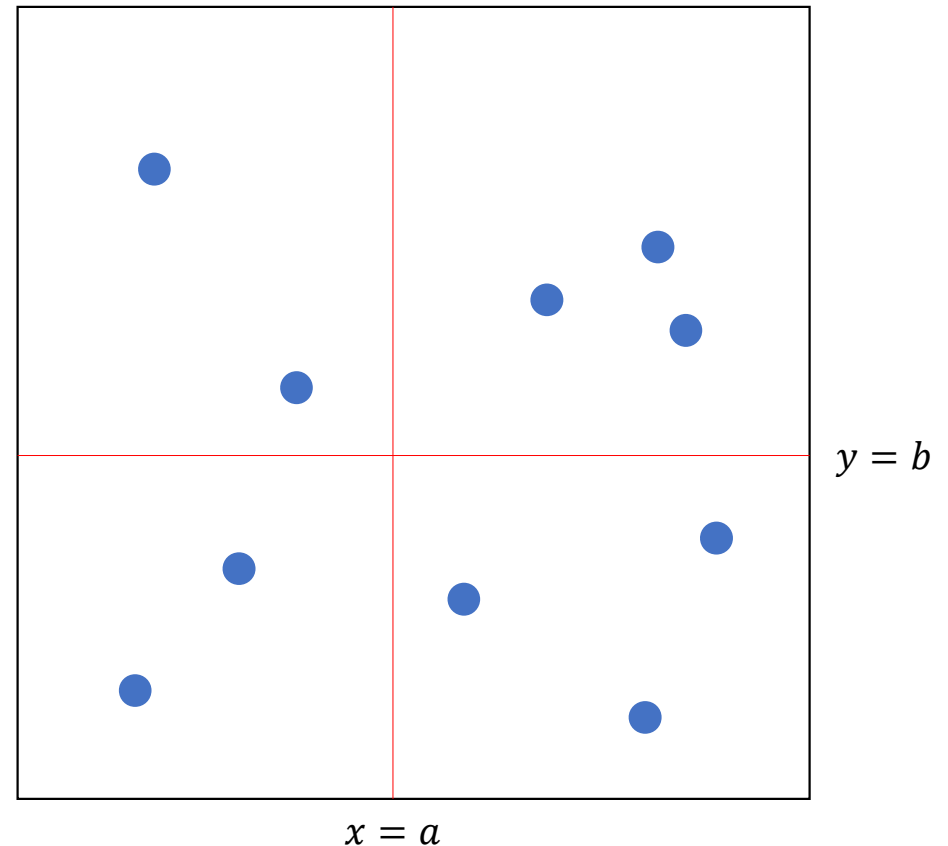
# USACO和工作面试

## Example 1: Load Balancing

$N \leq 100$  (bronze)  
examine intervals

$N \leq 3000$  (silver)  
two pointers / prefix sum

$N \leq 100000$  (gold)  
binary search and BIT

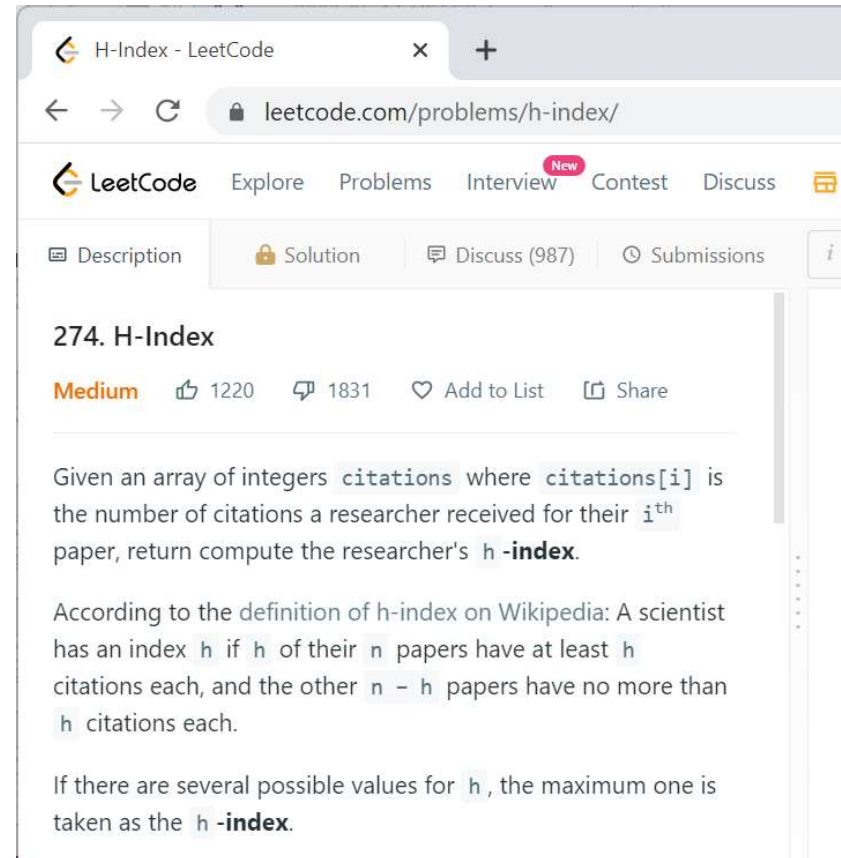


# USACO和工作面试

Example 2: H-index

$N \leq 5000$

(leetcode medium)



The screenshot shows the LeetCode website interface for the problem '274. H-Index'. The browser address bar shows 'leetcode.com/problems/h-index/'. The page title is 'H-Index - LeetCode'. The navigation menu includes 'Explore', 'Problems', 'Interview', 'Contest', and 'Discuss'. The problem description is as follows:

**274. H-Index**  
**Medium** 1220 1831 Add to List Share

Given an array of integers `citations` where `citations[i]` is the number of citations a researcher received for their  $i^{\text{th}}$  paper, return compute the researcher's **h-index**.

According to the definition of h-index on Wikipedia: A scientist has an index  $h$  if  $h$  of their  $n$  papers have at least  $h$  citations each, and the other  $n - h$  papers have no more than  $h$  citations each.

If there are several possible values for  $h$ , the maximum one is taken as the **h-index**.

# USACO和工作面试

## Example 2: H-index

$$N \leq 10000$$

(USACO 2021 bronze)

... Having worked for some time on her academic research, Bessie has now published  $N$  papers ( $1 \leq N \leq 10^5$ ), and her  $i$ -th paper has accumulated  $c_i$  citations ( $0 \leq c_i \leq 10^5$ ) from other papers in the research literature.

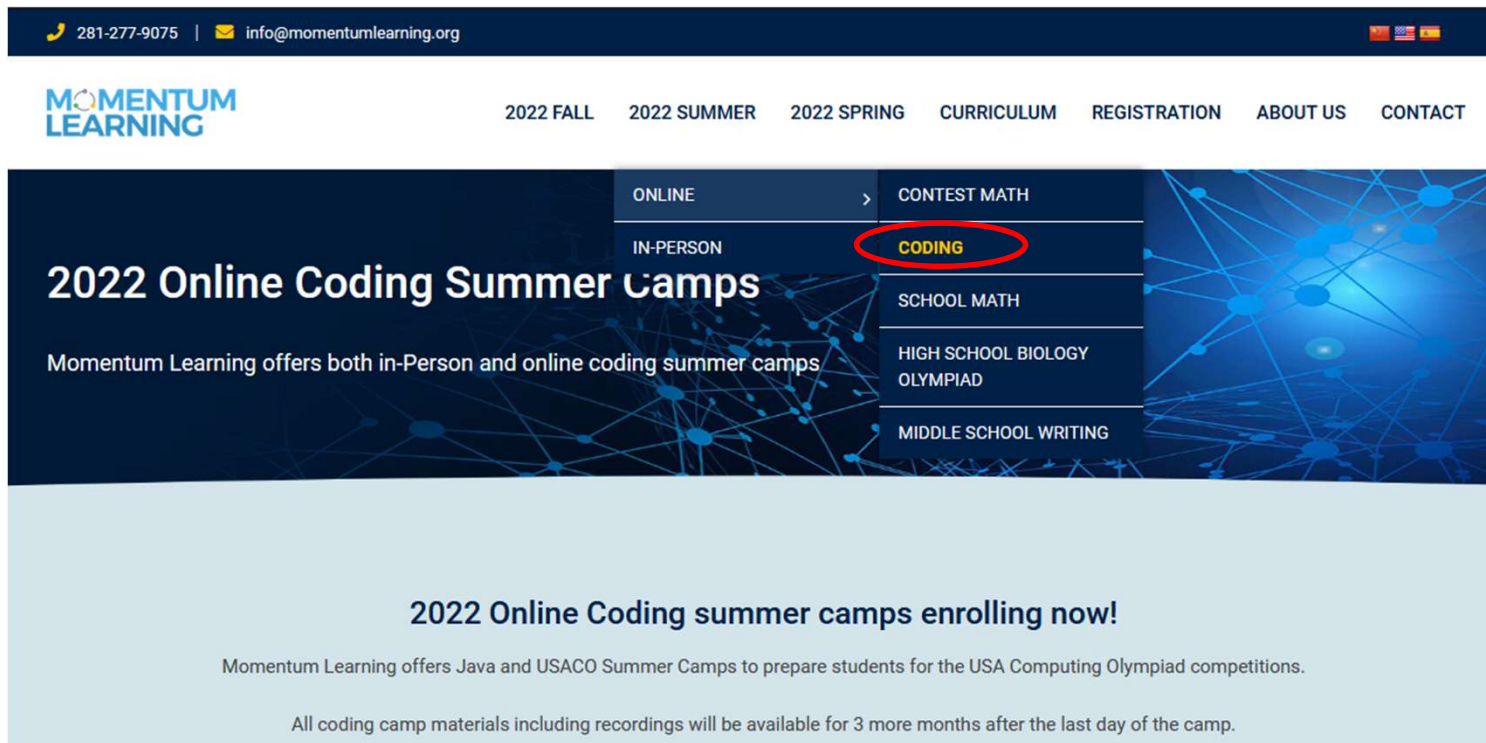
Bessie has heard that an academic's success can be measured by their h-index. The h-index is the largest number  $h$  such that the researcher has at least  $h$  papers each with at least  $h$  citations. ...

To up her h-index, Bessie is planning to write a survey article citing several of her past papers. Due to page limits, she can include at most  $L$  citations in this survey ( $0 \leq L \leq 10^5$ ), and of course she can cite each of her papers at most once.

Help Bessie determine the maximum h-index she may achieve after writing this survey.

# Momentum USACO 2022 Summer Camp

<https://www.momentumlearning.org/online-coding-summer-camps>



The screenshot shows the Momentum Learning website navigation menu. At the top, there is a dark blue header with contact information: a phone icon, the number 281-277-9075, an email icon, and the address info@momentumlearning.org. To the right of the header are three small flags representing the United States, the United Kingdom, and Spain. Below the header is the Momentum Learning logo on the left and a horizontal navigation menu with the following items: 2022 FALL, 2022 SUMMER, 2022 SPRING, CURRICULUM, REGISTRATION, ABOUT US, and CONTACT. A dropdown menu is open under the 2022 SUMMER item, showing two main categories: ONLINE and IN-PERSON. Under the ONLINE category, there is a list of options: CONTEST MATH, CODING (highlighted with a red circle), SCHOOL MATH, HIGH SCHOOL BIOLOGY OLYMPIAD, and MIDDLE SCHOOL WRITING. The main content area of the page features a dark blue background with a network diagram. The text reads: "2022 Online Coding Summer Camps" and "Momentum Learning offers both in-Person and online coding summer camps". Below this, a light blue banner contains the text: "2022 Online Coding summer camps enrolling now!" and "Momentum Learning offers Java and USACO Summer Camps to prepare students for the USA Computing Olympiad competitions." At the bottom of the banner, it states: "All coding camp materials including recordings will be available for 3 more months after the last day of the camp."

# Momentum USACO 2022 Summer Camp

<https://www.momentumlearning.org/online-coding-summer-camps>

Time: 10AM - 1PM & 2 - 5PM Central Time (6 hrs/day)

## Java

Session 1  
June 13 - 17 (M-F)\*

Session 2  
July 5 - 9 (Tu - Sat)

*Both Java sessions  
cover the same  
material*

## Bronze

Bronze 1 Session 1  
June 20 - 24 (M-F)

Bronze 1 Session 2  
July 11 - 15 (M-F)\*

Bronze 2 Session 1  
June 27 - July 1 (M-F)

Bronze 2 Session 2  
July 18 - 2 (M-F)\*

## Silver

Silver 1  
July 25 - 29 (M-F)

Silver 2  
August 1 - 5 (M-F)

\* Hybrid Class (Students  
can attend either  
in-person or online)

### Camp selection recommendation

- **No programming experience:** Introduction to Java. Students not continue with Bronze 1 in the summer (for most cases), they should continue with Java 2 in the fall
- **Some programming experience or other programming experience (Python, C++):** For students who had prior programming experience, they may be able to advance to Bronze A or Bronze 1 if they pass the Bronze A/1 self-assessment tests
- **Proficient with Java but no/limited USACO Bronze experience:** Bronze 1 (one session or both), then Bronze 2 (only if students complete both Bronze 1 sessions)
- **USACO Bronze test score 400 – 700:** Bronze 2 (one session or both), then Silver 1 (only if students complete both Bronze 2 sessions)
- **USACO Silver Qualifier:** Silver 1, then Silver 2
- **USACO Silver test score 400 – 700:** Silver 2

### Discount

- \$50 additional discount for each additional USACO class

## Contact Us

**Call us at 281-277-9075**

**Office Hours**

Monday/Wednesday/Thursday: 4PM – 7PM

Saturday: 11AM – 2PM

Or **email us** at

[info@momentumlearning.org](mailto:info@momentumlearning.org)

For those who use Wechat, you can connect with Mr. Cai if you have questions:

