



DEPARTMENT OF COMPUTERSCIENCE & ENGINEERING

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Experiment– 9

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1. Aim: solve the various problems.

- Easy:** Hamming Distance, Pascal's Triangle
- Medium:** Valid Parenthesis String , Divide Two Integers
- Hard:** Max number of tasks you can assign ,

2. Algorithm:

- EASY1:** Pascal's Triangle
 - Initialize a 2D vector triangle.
 - For each row i from 0 to numRows - 1:
 - Create a row of size i + 1.
 - Set first and last elements to 1.
 - Fill middle elements using values from previous row.
 - Return the triangle.
- Easy2:** Hamming Distance
 - Initialize a counter cnt to 0. This will store the number of differing bits.
 - While both x and y are not zero:
Compare the least significant bits of x and y using $(x \& 1) \wedge (y \& 1)$.
If the bits differ, increment cnt.
Right shift both x and y by 1 bit.
 - If x still has remaining bits:
For each set bit in x, increment cnt.
Right shift x until it's 0.
 - If y still has remaining bits:
For each set bit in y, increment cnt.
Right shift y until it's 0.
 - Return cnt.
- Medium1:** Divide Two Integers
 - Handle overflow case: if dividend = INT_MIN and divisor = -1, return INT_MAX.
 - Record the sign of result based on dividend and divisor.
 - Convert both numbers to long long and take their absolute values.
 - Repeatedly subtract (or use bit shifts to speed up) the divisor from dividend and count how many
 - Apply the sign to the result and return.

d. **Medium2:** Valid Parenthesis String

- Initialize two counters:
leftMin \rightarrow the **minimum** number of unmatched '(' that might still be open.
leftMax \rightarrow the **maximum** number of unmatched '(' that might still be open.
- Loop through each character c in the string:
If c is '(':
Increase both leftMin and leftMax by 1.
If c is ')':
Decrease both leftMin and leftMax by 1.
If c is '*':
'*' can be '(', ')', or empty:
Decrease leftMin by 1 (assume it's ')')
Increase leftMax by 1 (assume it's '(')
- If at any point leftMax becomes negative:
Return false \rightarrow too many closing brackets.
- If leftMin drops below zero:
Reset leftMin to 0 \rightarrow we can ignore extra closing by treating '*' as empty.
- After processing the entire string:
If leftMin is 0, return true (all parentheses balanced)
Else, return false.

e. **Hard:** Max Number of tasks you can assign

- Let n be the size of target.
- Create a map map to store the index of each element in target \square Sort the tasks in ascending order.
- Sort the workers in ascending order.
- Set the search range for binary search: low = 0, high = min(number of workers, number of tasks).
- Initialize ans to store the final answer.
- **Binary Search Loop:**
While low \leq high:
Set mid = (low + high) / 2 \rightarrow trying to assign mid number of tasks.
Copy all workers into a multiset st to efficiently remove used workers.
Set a counter count = 0 to track pills used.
Set a flag flag = true to track if assignment is successful.
For each task from hardest to easiest among mid tasks:
Get the strongest available worker.
If the worker can do the task without a pill, assign and remove the worker.
Else, find the **weakest** worker that can do the task **with pill boost**.
If such worker exists, assign task, remove worker, increment count.
If not, set flag = false, break.
If count > p, break and set flag = false.
If assignment was successful (flag == true), store ans = mid and try a higher value (low = mid + 1).
Else, try a smaller value (high = mid - 1).
- Return ans \rightarrow maximum number of tasks that can be assigned.

3. Code:

a. **Hamming Distance:**

```
class Solution
{ public:
    int hamming Distance(int x, int
        y) { int cnt = 0;
        while(x && y)
            { if(x&1 ^ y&1)
                cnt++;    x >>= 1;    y >>= 1;
            }
        while(x) {
            if(x&1) { cnt++; }
            x >>= 1;
        }
        while(y) {
            if(y&1) { cnt++; }
            y >>= 1;
        }
        return cnt;
    }
};
```

b. **Pascal's Triangle:**

```
class Solution {
public:
    vector<vector<int>> generate(int numRows) {
        vector<vector<int>> res(numRows);
        for (int i = 0; i < numRows; i++) {
            res[i].resize(i + 1, 1);
            long long ans = 1; // Store intermediate values to avoid overflow
            for (int j = 1; j < i; j++) {
                ans = ans * (i - j + 1) / j; // Using binomial coefficient formula
                res[i][j] = ans;
            }
        }
        return res;
    }
};
```

c. Divide Two Integers:

```
int divide(int dividend, int divisor) {
    if (dividend == INT_MIN && divisor == -1)
        return INT_MAX;

    long long a = abs((long long)dividend);
    long long b = abs((long long)divisor);
    int result = 0;

    while (a >= b) {
        long long temp = b, multiple = 1;
        while (a >= (temp << 1)) {
            temp <<= 1;
            multiple <<= 1;
        }
        a -= temp;
        result += multiple;
    }

    return ((dividend > 0) ^ (divisor > 0)) ? -result : result;
}
```

d. Valid Parenthesis String:

```
class Solution
{ public:
    bool checkValidString(string
s) { int leftMin = 0, leftMax =
0; for (char c : s) {
        if (c == '(') {
            leftMin++;
            leftMax++;
        } else if (c == ')')
            { leftMin--;
              leftMax--;
            } else {
                leftMin--;
                leftMax++;
            }
        if (leftMax < 0) return false;
        if (leftMin < 0) leftMin = 0;
    }

    return leftMin == 0;
}
};
```

e. Max number of task you can assign

class Solution

{ public:

int maxTaskAssign(vector<int>& tasks, vector<int>& workers, int p, int strength)

{ int n = tasks.size(), m = workers.size();

sort(tasks.begin(), tasks.end());

sort(workers.begin(), workers.end());

int lo = 0, hi = min(m, n);

int ans;

while(lo <= hi) {

int mid = lo + (hi - lo) / 2;

int count = 0;

bool flag = true;

multiset<int> st(workers.begin(), workers.end());

for(int i = mid - 1; i >= 0; i--) {

auto it = prev(st.end());

if(tasks[i] <= *it) {

st.erase(it);

} else {

auto it = st.lower_bound(tasks[i] - strength);

if(it != st.end()) {

count++;

st.erase(it);

} else {

flag = false;

break;

}

}

if(count > p)

{ flag =

false; break;

}

}

if(flag) {

ans = mid;

lo = mid + 1;

} else {

hi = mid - 1;

}} return ans; };



4. Output:

Easy: Hamming Distance

DescriptionEditorialSolutionsSubmissions

461. Hamming Distance

EasyTopicsCompanies

The **Hamming distance** between two integers is the number of positions at which the corresponding bits are different.

Given two integers x and y , return the **Hamming distance** between them.

Example 1:

Input: $x = 1, y = 4$

Output: 2

Explanation:

1 (0 0 0 1)

4 (0 1 0 0)

↑ ↑

The above arrows point to positions where the corresponding bits are different.

Example 2:

Input: $x = 3, y = 1$

Output: 1

Constraints:

3.9K3417 Online

Code

C++Auto

```
1 class Solution {
2 public:
3     int hammingDistance(int x, int y) {
4         int cnt = 0;
5         while(x && y) {
6             if(x&1 ^ y&1)
7                 cnt++;
8             x >>= 1;
9             y >>= 1;
10        }
11    }
12 }
```

Ln 23, Col 3Saved

RunSubmit

TestcaseTest Result

AcceptedRuntime: 0 ms

Case 1Case 2

Input

x =

1

y =

4

Output

EASY : PASCAL TRIANGLE

Runtime

3 msBeats 7.92%

Analyze Complexity

Memory

9.85 MBBeats 12.44%

100%

50%

0%

1ms2ms3ms4ms

45678910111213141516

```
// chatgpt ans
vector<vector<int>> res(numRows);

for (int i = 0; i < numRows; i++) {
    res[i].resize(i + 1, 1);
    long long ans = 1; // Store intermediate values to avoid overflow

    for (int j = 1; j < i; j++) {
        ans = ans * (i - j + 1) / j; // Using binomial coefficient formula
        res[i][j] = ans;
    }
}
```

Saved

TestcaseTest Result

Case 1Case 2+

numRows =

5

CodeC++Source



Medium: Divide Two Integers

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29. Divide Two Integers Solved

Medium Topics Companies

Given two integers `dividend` and `divisor`, divide two integers **without** using multiplication, division, and mod operator.

The integer division should truncate toward zero, which means losing its fractional part. For example, `8.345` would be truncated to `8`, and `-2.7335` would be truncated to `-2`.

Return the **quotient** after dividing `dividend` by `divisor`.

Note: Assume we are dealing with an environment that could only store integers within the **32-bit** signed integer range: $[-2^{31}, 2^{31} - 1]$. For this problem, if the quotient is **strictly greater than** $2^{31} - 1$, then return $2^{31} - 1$, and if the quotient is **strictly less than** -2^{31} , then return -2^{31} .

Example 1:

Input: `dividend = 10, divisor = 3`
Output: `3`
Explanation: `10/3 = 3.33333..` which is truncated to `3`.

Example 2:

Input: `dividend = 7, divisor = -3`
Output: `-2`

5.6K 309 104 Online

Code

C++ Auto

```
1 class Solution {
2 public:
3     int divide(int dividend, int divisor) {
4         if (dividend == INT_MIN && divisor == -1) {
5             return INT_MAX;
6         }
7
8         // Convert to long long before taking absolute values
9         long long abs_dividend = abs((long long)dividend);
10        long long abs_divisor = abs((long long)divisor);
11
12        // Determine sign
13        bool negative = (dividend < 0) ^ (divisor < 0);
14
15        long long quotient = 0;
16    }
17 }
```

Saved

Testcase | Test Result

Accepted Runtime: 0 ms

Case 1 Case 2

Input

dividend =

10

divisor =

Medium: Valid parenthesis String

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678. Valid Parenthesis String Solved

Medium Topics Companies Hint

Given a string `s` containing only three types of characters: `'('`, `')'` and `'*'`, return `true` if `s` is **valid**.

The following rules define a **valid** string:

- Any left parenthesis `'('` must have a corresponding right parenthesis `')'`.
- Any right parenthesis `')'` must have a corresponding left parenthesis `'('`.
- Left parenthesis `'('` must go before the corresponding right parenthesis `')'`.
- `'*'` could be treated as a single right parenthesis `')'` or a single left parenthesis `'('` or an empty string `''`.

Example 1:

Input: `s = "()"`
Output: `true`

Example 2:

Input: `s = "(*)"`
Output: `true`

Example 3:

6.5K 171 43 Online

Code

C++ Auto

```
8 leftMin++;
9 leftMax++;
10 } else if (c == ')') {
11     leftMin--;
12     leftMax--;
13 } else {
14     leftMin--;
15     leftMax++;
16 }
17 if (leftMax < 0) return false;
18 if (leftMin < 0) leftMin = 0;
```

Ln 23, Col 3 Saved

Run Submit

Testcase | Test Result

Accepted Runtime: 0 ms

Case 1 Case 2 Case 3

Input

s =

"()"

Output

true

Expected



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Hard: Max number of tasks you can assign

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2071. Maximum Number of Tasks You Can Assign

Hard | Topics | Companies | Hint

You have n tasks and m workers. Each task has a strength requirement stored in a **0-indexed** integer array `tasks`, with the i^{th} task requiring `tasks[i]` strength to complete. The strength of each worker is stored in a **0-indexed** integer array `workers`, with the j^{th} worker having `workers[j]` strength. Each worker can only be assigned to a **single** task and must have a strength **greater than or equal** to the task's strength requirement (i.e., `workers[j] >= tasks[i]`).

Additionally, you have `pills` magical pills that will **increase a worker's strength** by strength. You can decide which workers receive the magical pills, however, you may only give each worker **at most one** magical pill.

Given the **0-indexed** integer arrays `tasks` and `workers` and the integers `pills` and `strength`, return the **maximum** number of tasks that can be completed.

Example 1:

Input: `tasks = [3,2,1]`, `workers = [0,3,3]`, `pills = 1`, `strength = 1`

Output: 3

Explanation:

We can assign the magical pill and tasks as follows:

- Give the magical pill to worker 0.
- Assign worker 0 to task 2 ($0 + 1 >= 1$)

Code

C++ v Auto

```
1 class Solution {
2 public:
3     int maxTaskAssign(vector<int>& tasks, vector<int>& workers, int p, int strength) {
4         int n = tasks.size(), m = workers.size();
5         sort(tasks.begin(), tasks.end());
6         sort(workers.begin(), workers.end());
7         int lo = 0, hi = min(m, n);
8         int ans;
9         while(lo <= hi) {
10             int mid = lo + (hi - lo) / 2;
11             int count = 0;
```

Ln 8, Col 17 | Saved

Run Submit

Testcase | Test Result

Accepted Runtime: 0 ms

Case 1 Case 2 Case 3

Input

tasks =
[3,2,1]

workers =
[0,3,3]

pills =
1

566 | 6 | 4 Online



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