I. Important Formulas in Analysis

algorithm

C++ code

$$\sum_{i=1}^{u} 1 = u - l + 1$$

L

```cpp
int i = 0;
int n = 5;
while (i<=n){
    cout << "hi" << endl;
    i++;
}
```

algorithm

C++ code

$$\sum_{i=0}^{n} i = \sum_{i=1}^{n} i = 1+2+\ldots+n = \frac{n(n+1)}{2} \approx \frac{1}{2}n^2 \in \Theta(n^2)$$

```cpp
int i, j
int n = 5;
for (i= 1; i<=n; i++){
    for (j=1; j<= i; j++) {
        cout << "hi" << endl;
    }
}
```

II. Practice Problems

$$[0, 1, 3, 2, 7, 3, 5] \quad O(n^2)$$

```
[i  j
    i  -  -  -  -  -  -
    i  -  -  -  -  -  -
```

Distinct
array elements
algorithm

```
    i  -  -  -  -  -
    i  -  -  -  -
    i  -  -
    i  -
```

```cpp
for (int i=0; i<n-2; i++){
    for (int j= i+1; j<=n-1; j++){
        if (A[i] == A[j]){
            return false;
        }
    }
}
```

Number of Binary digits

in   Bin   out

$5 \to 101 \to 3$ $5 \% 2 = 1 \to 1\ 0\ 1$

$6 \to 1000 \to 4$ $5/2 = 2$

$11 \to 1011 \to 4$ $2 \% 2 = 0$

$2/2 = 1$

$1 \% 2 = 1$

```
count = 1;
while (n > 1) {
    count ++;
    n /= 2;
}
return count;
```

$16 \to 8 \to 4 \to 2 \to 1$

$O(\log n)$