

1) unordered complexities

ordered complexities

$\frac{N}{\sqrt{N}}$
 $N^{1.5}$
 N^2
 $N \log N$
 $N \log(\log(N))$
 $N \log^2 N$
 $2/N$
 2^N
 $2^{(N/2)}$
 3^N
 $N^2 \log(N)$
 N^4

$2/N$
 3^N
 \sqrt{N}
 N
 $N \log(\log(N))$
 $N \log N$
 $N \log^2 N$
 $N^{1.5}$
 N^2
 $N^2 \log N$
 N^4
 $2^{N/2}$
 2^N

② $O(N)$

$$\frac{35 \text{ sec} \cdot 100 \text{ input}}{20 \text{ input}} = 175 \text{ sec}$$

$$- O(N + \log N) \quad \left(\frac{35 \text{ sec}}{20 \text{ input}} + \log 20 \right) (100 + \log 100) = 647.53 \text{ sec}$$

$$- O(N^3) \quad \left(\frac{35}{20^3} \cdot 100^3 \right) = 4375 \text{ sec}$$

$$- O(2^N) \quad \left(\frac{35}{20} \right)^{100} = 4.23 \times 10^5 \text{ sec}$$

3) A. $O(n)$ for both $f()$ and $g()$
 because of the recursion in $g()$ that
 runs n times $i=0$ to $n-1$. Also the for loop in
 $f()$ that runs n times $i=0$ to $n-1$

B) $g(): O(n)$ recursion.
 $f(): O(1)$ because it is constant.

C)

```
int h(int n) {
    return n * (n-1) / 2;
}
```

$O(1)$

4) the runtime complexity of $f()$ is $\log n$
 and $g()$ is $\log n \cdot \log n = (\log n)^2$

5) $O(n^2)$

```
int main() {
    int n, k;
    // ...
}
```

```

⑥ int main() {
    int x, k;
    bool number[10] = false;
    int k = 0;
    cout << "n: ";
    cin >> n;
    while (number[0] == false || number[1] == false
           || number[2] == false || ...
           || number[9] == false) {
        k++;
        int y = n * k;
        while (y != 0) {
            int j = y % 10;
            number[j] = true;
            y = y / 10;
        }
        cout << "k is: " << k << "\n";
        return 0;
    }
}

```

7) If $(n \% 2 == 0)$ return 0; // n is even
a) else // n is odd
return 1;

$O(1)$

b) $O(n)$, because we must go through every node in the list

c) $O(n)$ (traverse the list once)

d) $O(n^2)$, A loop is needed in order to traverse both lists after being sorted.

e) $O(n)$, A loop is required for the traversal.

f) $\log_2 n$, since the amount of iteration in the loop is half.

⑧ cp : makes copies of files / directories
rm : removes each file on the command line

ssh : connect to host as user

gcc : command line to compile

scp : Secure Copy of file or directories between two locations.

⑨ git is a distributed version-control system for tracking changes in source code. It is used to coordinate work among programmers, and can be used to track changes in any set of files.

⑩ argc and argv are command line arguments get values from the command lines.

argc refers to the number of arguments passed.

argv is a pointer array which points to each argument passed to the program