
Summary of Relevant Data Types

We tried to include the most relevant member functions and operators for the exam, but not all are listed. You are free to use ones not listed here that you know exist. *You do not need to do `#include` for these.*

```
class string {
    bool empty() const; // O(1)
    int size() const; // O(1)
    int find(char ch) const; // O(N)
    int find(char ch, int start) const; // O(N)
    string substr(int start) const; // O(N)
    string substr(int start, int length) const; // O(N)
    char& operator[](int index); // O(1)
    const char& operator[](int index) const; // O(1)
};

class Vector {
    bool isEmpty() const; // O(1)
    int size() const; // O(1)
    void add(const Type& elem); // operator+= used similarly - O(1)
    void insert(int pos, const Type& elem); // O(N)
    void remove(int pos); // O(N)
    Type& operator[](int pos); // O(1)
};

class Grid {
    int numRows() const; // O(1)
    int numCols() const; // O(1)
    bool inBounds(int row, int col) const; // O(1)
    Type get(int row, int col) const; // cascade of operator[] also works - O(1)
    void set(int row, int col, const Type& elem); // O(1)
};

class Stack {
    bool isEmpty() const; // O(1)
    void push(const Type& elem); // O(1)
    Type pop(); // O(1)
};
```

```
class Queue {
    bool isEmpty() const; // O(1)
    void enqueue(const Type& elem); // O(1)
    Type dequeue(); // O(1)
};
```

```
class Map {
    bool isEmpty() const; // O(1)
    int size() const; // O(1)
    void put(const Key& key, const Value& value); // O(logN)
    bool containsKey(const Key& key) const; // O(logN)
    Value get(const Key& key) const; // O(logN)
    Value& operator[](const Key& key); // O(logN)
};
```

Example for Loop: for (Key key : mymap){...}

```
class HashMap {
    bool isEmpty() const; // O(1)
    int size() const; // O(1)
    void put(const Key& key, const Value& value); // O(1)
    bool containsKey(const Key& key) const; // O(1)
    Value get(const Key& key) const; // O(1)
    Value& operator[](const Key& key); // O(1)
};
```

Example for Loop: for (Key key : mymap){...}

```
class Set {
    bool isEmpty() const; // O(1)
    int size() const; // O(1)
    void add(const Type& elem); // operator+= also adds elements - O(logN)
    bool contains(const Type& elem) const; // O(logN)
};
```

Example for Loop: for (Type elem : mymap){...}

```
class Lexicon {
    int size() const; // O(1)
    bool isEmpty() const; // O(1)
    void clear(); // O(N)
    void add(string word); // O(W) where W is word.length()
    bool contains(string word) const; // O(W) where W is word.length()
    bool containsPrefix(string pre) const; // O(W) where W is pre.length()
};
```

Example for Loop: for (string str : english){...}