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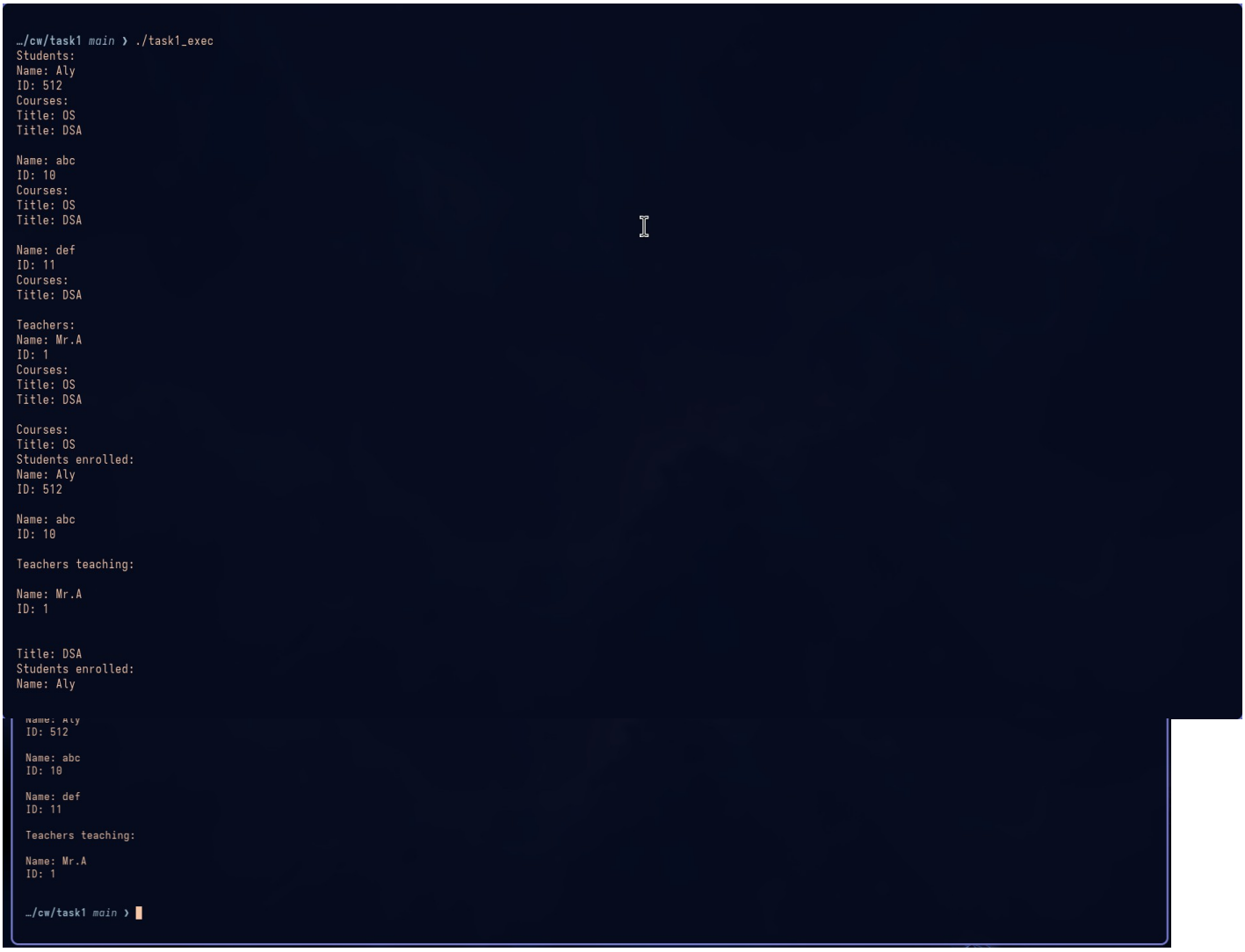
OS Lab 2 Tasks

CW

task 1)



Makefile:

```
o_files = build/main.o build/student.o build/teacher.o build/course.o
output = task1_exec

# how this works:
# make build > adds all .o files to build/ and builds an executable
# make run > runs the executable, if available, else makes it first
# make clean > removes all .o files
# make full_clean > resets the directory
```

```
.PHONY: run build clean full_clean # not files

build: $(output)

$(output): $(o_files)
	g++ $(o_files) -o $(output)

build/%.o: %.cpp
	mkdir -p build
	g++ -c $< -o $@

run: $(output)
	./$(output)

clean:
	rm -rf build

full_clean: clean
	rm -f $(output)
```

Headers:

// student.h

```
#pragma once

#include <iostream>
using namespace std;

#include "course.h"

class Course;

class Student
{
private:
    const string name;
```

```
    const int id;
    vector<Course*> enrolled;
public:
    Student(const string n, const int i);
    string getName() const;
    int getID() const;

    void AddCourse(Course& c);

    void display() const;
};
```

// teacher.h

```
#pragma once

#include <iostream>
using namespace std;

#include "course.h"

class Course;

class Teacher
{
private:
    const string name;
    const int id;
    vector<Course*> teaching;
public:
    Teacher(const string name, const int id);
    string getName() const;
    int getID() const;

    void AddCourse(Course& c);
```

```
    void display() const;
};
```
// course.h
```
#pragma once

#include <iostream>
#include <string>
#include <vector>
using namespace std;

#include "student.h"
#include "teacher.h"

class Student;
class Teacher;

class Course
{
private:
    string title;
    vector<Student*> taking;
    vector<Teacher*> teaching;
public:
    Course(const string t);
    string getTitle() const;

    void AddStudent(Student& s);
    void AddTeacher(Teacher& t);

    void display() const;
};
```

Source Files:

// student.cpp
```
#include "student.h"
```

```
Student::Student(const string n, const int i) : name(n), id(i)
{

}

string Student::getName() const
{
   return name;
}

int Student::getID() const
{
   return id;
}

void Student::AddCourse(Course& c)
{
   enrolled.emplace_back(&c);
}

void Student::display() const
{
   cout << "Name: " << name << endl;
   cout << "ID: " << id << endl;

   cout << "Courses:\n";
   for(Course* c : enrolled)
   {
      cout << "Title: " << c->getTitle() << endl;
   }
}
```

// teacher.cpp

```
#include "teacher.h"
```

```
Teacher::Teacher(const string n, const int i) : name(n), id(i)
{

}

string Teacher::getName() const
{
   return name;
}

int Teacher::getID() const
{
   return id;
}

void Teacher::AddCourse(Course& c)
{
   teaching.emplace_back(&c);
}

void Teacher::display() const
{
   cout << "Name: " << name << endl;
   cout << "ID: " << id << endl;

   cout << "Courses:\n";
   for(Course* c : teaching)
   {
      cout << "Title: " << c->getTitle() << endl;
   }
}
```

// course.cpp

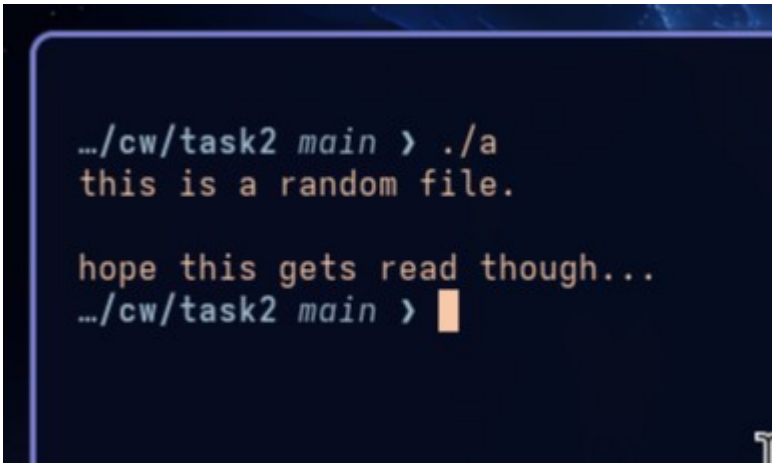
```
#include "course.h"

Course::Course(const string t) : title(t)
```

```
{

}

string Course::getTitle() const
{
   return title;
}

void Course::AddStudent(Student& s)
{
   taking.emplace_back(&s);
}

void Course::AddTeacher(Teacher& t)
{
   teaching.emplace_back(&t);
}

void Course::display() const
{
   cout << "Title: " << title << endl;

   cout << "Students enrolled:\n";
   for(auto s : taking)
   {
      cout << "Name: " << s->getName() << endl;
      cout << "ID: " << s->getID() << endl << endl;
   }

   cout << "Teachers teaching:\n" << endl;
   for(auto t : teaching)
   {
      cout << "Name: " << t->getName() << endl;
      cout << "ID: " << t->getID() << endl << endl;
```

```
    }
}
// main.cpp
#include "course.h"
#include "student.h"
#include "teacher.h"

#include <iostream>
using namespace std;

void enrollStudent(Student& s, Course& c)
{
    s.AddCourse(c);
    c.AddStudent(s);
}

void assignTeacher(Teacher& t, Course& c)
{
    t.AddCourse(c);
    c.AddTeacher(t);
}

int main()
{
    Student s1("Aly", 512);
    Student s2("abc", 10);
    Student s3("def", 11);

    Teacher t("Mr.A", 1);

    Course c1("OS");
    Course c2("DSA");

    enrollStudent(s1, c1);
    enrollStudent(s1, c2);
```

```
    enrollStudent(s2, c1);
    enrollStudent(s2, c2);

    enrollStudent(s3, c2);

    assignTeacher(t, c1);
    assignTeacher(t, c2);

    cout << "Students:" << endl;
    s1.display();
    cout << endl;
    s2.display();
    cout << endl;
    s3.display();
    cout << endl;

    cout << "Teachers:" << endl;
    t.display();
    cout << endl;

    cout << "Courses:" << endl;
    c1.display();
    cout << endl;
    c2.display();

    return 0;
}
```

task 2)

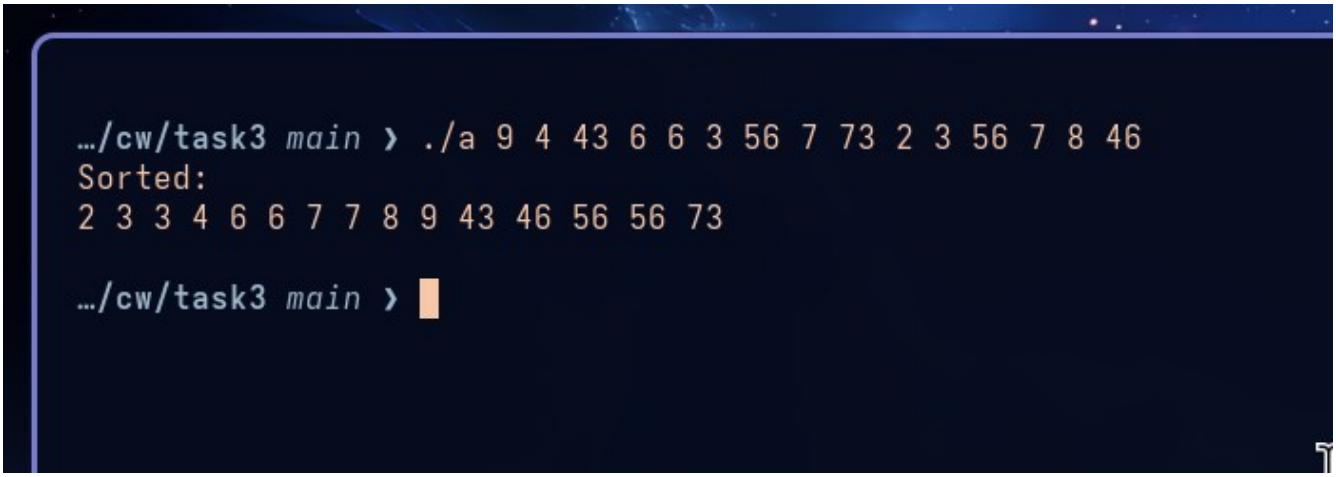



```
// file.txt
this is a random file.

hope this gets read though…
```

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>


int main(int argc, char** argv)
{
    const char* filename = "file.txt";
    char command[50] = "cat ";

    FILE* f = fopen(filename, "r");

    if(f == NULL)
    {
        perror("Error \'file_not_found\'");
        exit(1);
    }

    strcat(command, filename);
    system(command);
```

```
    fclose(f);

    return 0;
}
```

task 3)

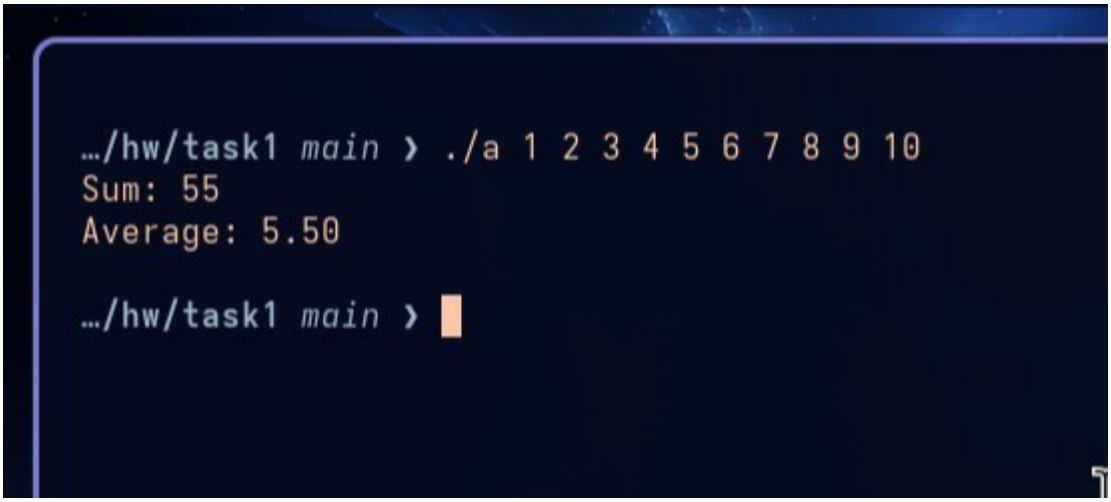



```
#include <iostream>
#include <vector>
#include <algorithm>
using namespace std;

int main(int argc, char** argv)
{
    vector<int> vals;

    for(int i = 1; i < argc; i++)
    {
        vals.push_back(atoi(argv[i]));
    }

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

    cout << "Sorted: " << endl;
    for(auto v : vals)
    {
        cout << v << ' ';
```

```
    }
    cout << endl;

    return 0;
}
```

HW

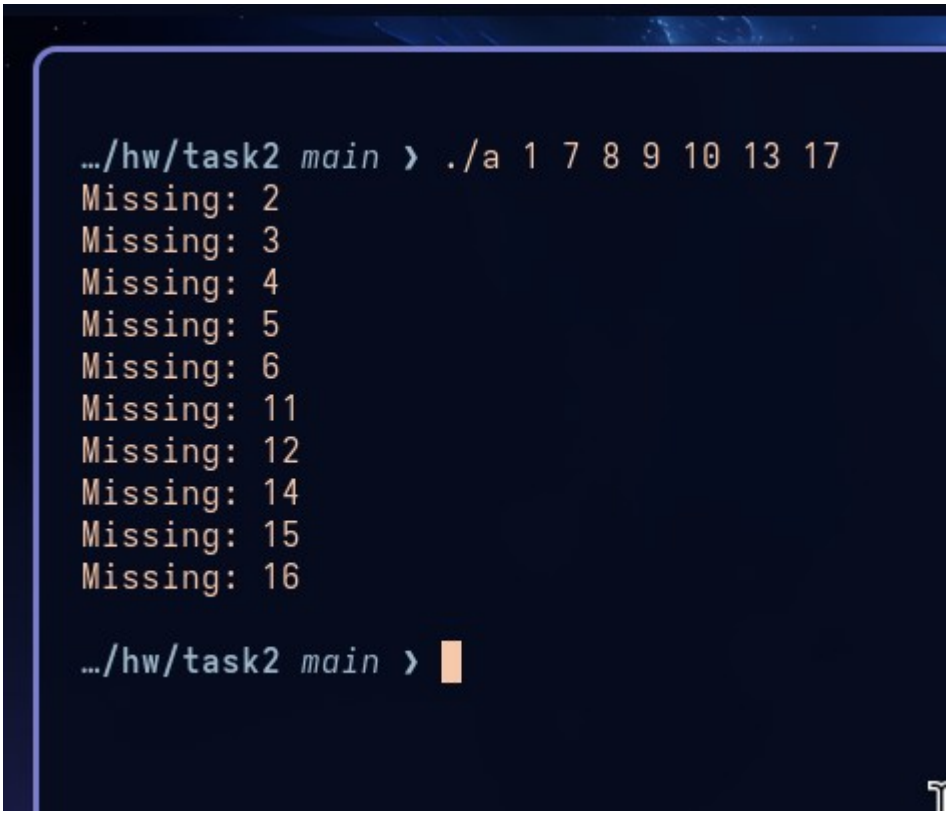
task 1)




```
#include <stdio.h>
#include <stdlib.h>

int main(int argc, char** argv)
{
        int vals[100];
        for(int i = 1; i < argc; i++)
        {
                vals[i-1] = atoi(argv[i]);
        }

        int sum = 0;
        for(int i = 0; i < argc - 1; i++)
        {
                sum += vals[i];
        }
        float avg = (float)sum / (argc - 1);
        printf("Sum: %d\nAverage: %.2f\n", sum, avg);
```

```
        return 0;
}
```

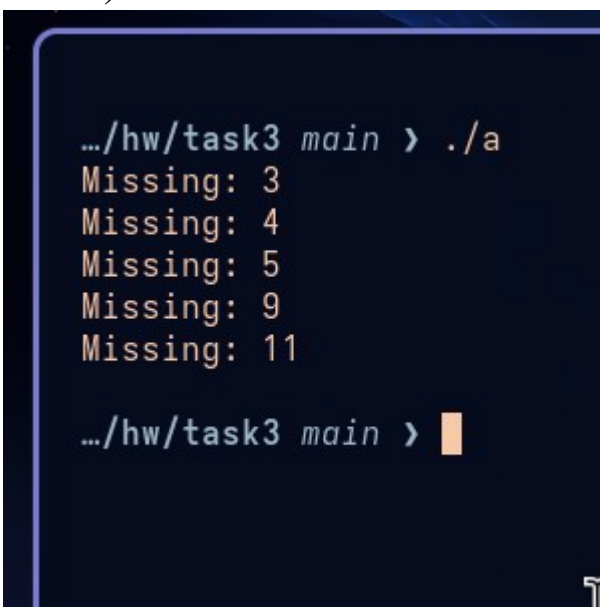
task 2)




```
#include <stdio.h>
#include <stdlib.h>

int main(int argc, char** argv)
{
    int list[100];
    for(int i = 1; i < argc; i++)
    {
        list[i - 1] = atoi(argv[i]);
    }
    int index = list[0];

    for(int i = 1; i < argc - 1; i++)
    {
```

```
        if(list[i] == index + 1)
        {
            index++;
            continue;
        }
        else
        {
            printf("Missing: %d\n", index + 1);
            index++;
            i--;
        }
    }

    return 0;
}
```

task 3)

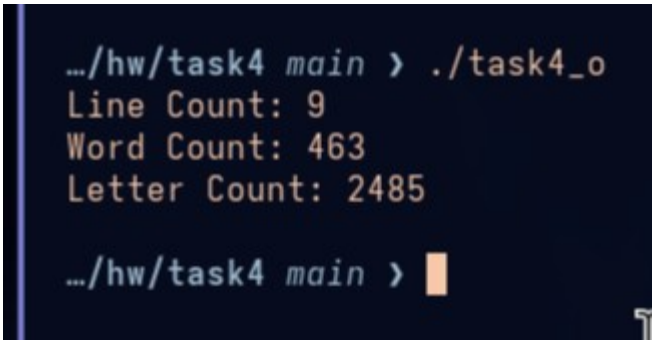



```
// seq.txt
1 2 6 7 8 10 12
// a.c
#include <stdio.h>
#include <stdlib.h>
```

```
int main() {

    FILE *file;
    char *filename = "seq.txt";
    int list[100];

    file = fopen(filename, "r");
    if(file == NULL)
    {
       printf("Error opening file!\n");
       return -1;
    }

    int index = fscanf(file, "%d", & list[0]);

    for(int i = 1; i < 100; i++)
    {
       if(fscanf(file, "%d", &list[i]) == 1)
       {
          while(list[i] != index + 1)
          {
             printf("Missing: %d\n", index + 1);
             index++;
          }
          index++;
          continue;
       }
       else
       {
          break;
       }
    }

    fclose(file);
```

```
    return 0;
}
```

task 4)



// makefile

```
src = main.cpp letter.cpp line.cpp word.cpp
o_files = build/main.o build/letter.o build/line.o build/word.o
output = task4_o

# how this works:
# make build > adds all .o files to build/ and builds an executable
# make run > runs the executable, if available, else makes it first
# make clean > removes all .o files
# make full_clean > resets the directory

.PHONY: run build clean full_clean # not files

build: $(output)

$(output): $(o_files)
	g++ $(o_files) -o $(output)

build/%.o: %.cpp
	mkdir -p build
	g++ -c $< -o $@

run: $(output)
	./$(output)
```

```
clean:
	rm -rf build

full_clean: clean
	rm -f $(output)
```

Headers:

// letter.h

```
#pragma once

#include <iostream>
#include <fstream>
#include <string>
using namespace std;

class LetterCount
{
   private:
      int numLetters = 0;
      string buff;
   public:
      LetterCount(const string& filename);
      int getNumLetters() const;
};
```

// word.h

```
#pragma once

#include <iostream>
#include <fstream>
#include <string>
using namespace std;

class WordCount
{
```

```
    private:
        int numWords = 0;
        string buff;
    public:
        WordCount(const string& filename);
        int getNumWords() const;
};
```

// line.h

```
#pragma once

#include <iostream>
#include <fstream>
#include <string>
using namespace std;

class LineCount
{
    private:
        int numLines = 0;
        string buff;
    public:
        LineCount(const string& filename);
        int getNumLines() const;
};
```

Source Files:

// letter.cpp

```
#include "letter.h"

LetterCount::LetterCount(const string& filename)
{
    ifstream file(filename);

    if(file.is_open())
    {
        while(getline(file, buff))
```

```
        {
            for(char c : buff)
            {
                if(isalnum(c))
                {
                    numLetters++;
                }
            }
        }

        file.close();
    }
    else
    {
        cerr << "Unable to open file!" << endl;
    }

}

int LetterCount::getNumLetters() const
{
    return numLetters;
}
```

// word.cpp

```
#include "word.h"

WordCount::WordCount(const string& filename)
{
    ifstream file(filename);

    if(file.is_open())
    {
        while(getline(file, buff))
        {
            bool isWord = false;
```

```
            for(char c : buff)
            {
               if(isalnum(c) && !isWord)
               {
                  isWord = true;
                  numWords++;
               }
               if(c == ' ' && isWord)
               {

                  isWord = false;
               }
            }
         }
      }

      file.close();
}

int WordCount::getNumWords() const
{
   return numWords;
}
```

// line.cpp

```
#include "line.h"

LineCount::LineCount(const string& filename)
{
   ifstream file(filename);

   if(file.is_open())
   {
      while(getline(file, buff))
      {
```

```
            numLines++;
        }
    }

    file.close();
}

int LineCount::getNumLines() const
{
    return numLines;
}
```
// main.cpp
```
#include <iostream>
using namespace std;

#include "letter.h"
#include "word.h"
#include "line.h"

int main()
{
    LetterCount let("text.txt");
    LineCount li("text.txt");
    WordCount wo("text.txt");

    cout << "Line Count: " << li.getNumLines() << endl;
    cout << "Word Count: " << wo.getNumWords() << endl;
    cout << "Letter Count: " << let.getNumLetters() << endl;

    return 0;
}
```
// text.txt

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