

CSCI 135 Software Design and Analysis, C++

Lab 6

Solution

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Lab A: Caesar cipher

Caesar cipher is a simple method of encryption. In a Caesar cipher each letter in a word is replaced by a letter some specified number of positions down the alphabet. e.x: "hello" shifted 1 letter right becomes "ifmmp"

"hello" shifted 2 letters right becomes "jgnnq"

(a) In main, create an array called alphabet which contains all 26 letters of the English alphabet.

Write a function called letter_index that takes an array of letters, the size of the array and a letter. The letter_index function should return the index of the letter in the array.

letter_index has the following signature:

```
int letter_index(char * alphabet, int
    alphabet_size, char letter)
```

(b) Write a function encrypt that takes an array of alphabet letters, an array of letters in a message, and the number of places to RIGHT shift the message. encrypt should shift the letters in the message and output the new message.

e.x: "hello" shifted 2 letters with encrypt should output "jgnnq"

encrypt has the following signature:

```
void encrypt(char * alphabet, int alphabet_size,
    char * arr, int size, int shift)
```

(c) Write a function decrypt. decrypt is the same as encrypt except decrypt shifts LEFT.

e.x: "jgnnq" shifted 2 letters with decrypt should output "hello"

decrypt has the following signature:

```
void decrypt(char * alphabet, int alphabet_size,
    char * arr, int size, int shift)
```

Lab B: Point

Point is a class which we define below. An object of class Point or an instance of class Point represents a point on an x-y plane. A Point object has a x-coordinate: `x_coord` and a y-coordinate: `y_coord`

```
class Point {
    double x_coord;
    double y_coord;
public:
    Constructors Point() { x_coord = 0; y_coord = 0; }
    Point(double x, double y) { ... } // (a)
    double x() {return x_coord;}
    double y() {return y_coord;}
    void translate(double x, double y) { ... } // (b)
};
```

(a) Complete the incomplete constructor.

(b) Complete the translate function.

To translate a point is to move it a specified amount along the x-axis and/or the y-axis.

e.x: The point(3,5) translated (-1, 2) becomes (3-1, 5+2) = (2, 7)

(c) Write a function, that takes a line segment represented as two points, and returns a point which is the middle of the segment.

(d) Write a function, that takes two points, and returns the distance between the points.

Given two points (x_1, y_1) and (x_2, y_2) , the distance between these points is given by the formula:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$