

AP COMPUTER SCIENCE A – CAESAR CIPHER

Julius Caesar sent messages to his battlefields using the now-called Caesar Cipher, which encrypts messages by adding three positions to each letter. For example, “A” encrypts to “D”, “B” encrypts to “E”, *etc.* Here you will write a program `CaesarCipher` which performs this operation.

You will use the class `Keyboard`, listed below, as is.

```
public class Keyboard {
    /**/
    private char [] kbChar;
    /**/
    public Keyboard () {
        init();
    }
    /**/
    public int getNumChars () {
        return kbChar.length;
    }
    /**/
    public char getCharFromIndex ( int index ) {
        return kbChar[index];
    }
    /**/
    public int getIndexFromChar ( char c ) {
        /**/
        for ( int i=0; i<kbChar.length; ++i ) {
            if ( kbChar[i] == c ) return i;
        }
        /**/
        return -1;
    }
    /**/
    private void init ( ) {
        /**/
        kbChar = new char [] {
            '\'', '1', '2', '3', '4', '5', '6', '7', '8', '9', '0', '-', '=',
            'q', 'w', 'e', 'r', 't', 'y', 'u', 'i', 'o', 'p', '[', ']', '\\',
            'a', 's', 'd', 'f', 'g', 'h', 'j', 'k', 'l', ';', '\'',
            'z', 'x', 'c', 'v', 'b', 'n', 'm', ',', '/',
            '~', '!', '@', '#', '$', '%', '^', '&', '*', '(', ')', '_', '+',
            'Q', 'W', 'E', 'R', 'T', 'Y', 'U', 'I', 'O', 'P', '{', '}', '|',
            'A', 'S', 'D', 'F', 'G', 'H', 'J', 'K', 'L', ':', '"',
            'Z', 'X', 'C', 'V', 'B', 'N', 'M', '<', '>', '?', ' '
        };
        /**/
        return;
    }
}
```

Note that this class is a container for the characters on an American keyboard.

1) Write a class `Caesar` which

- a)** has a constructor with signature `public Caesar (Keyboard kb, int offset)`, where `offset` is the value to add to each character. Your constructor should initialize the private fields `private int offset` and `private Keyboard kb`.
- b)** has a method `public char encrypt (char c)` which encrypts a character, and a method `public char decrypt (char c)` which decrypts a character.

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- 2) Write a class `CaesarCipher` containing a `main` method which
- a) reads in an input file containing text
 - b) modifies the text, *i.e.*, by encrypting it or decrypting it, as appropriate
 - c) prints the modified text to an output file
 - d) when running your program, the console should look something like

```
Enter option:
  1 = encrypt
  2 = decrypt
    option ? 1
    offset ? 14
input file ? passage.txt
output file ? enc.txt
```

Note that the bold print corresponds to user input.

- e) When reading in the user input, your program should verify that `option` is either 1 or 2, and it should verify that the `offset` satisfies $0 < \text{offset} < \text{numChars}$, where `numChars` is the length of the array `kbChar` of class `Keyboard`.

Test your program by encrypting and decrypting the file `passage.txt`.