CS1073
FR03B
Assignment #7

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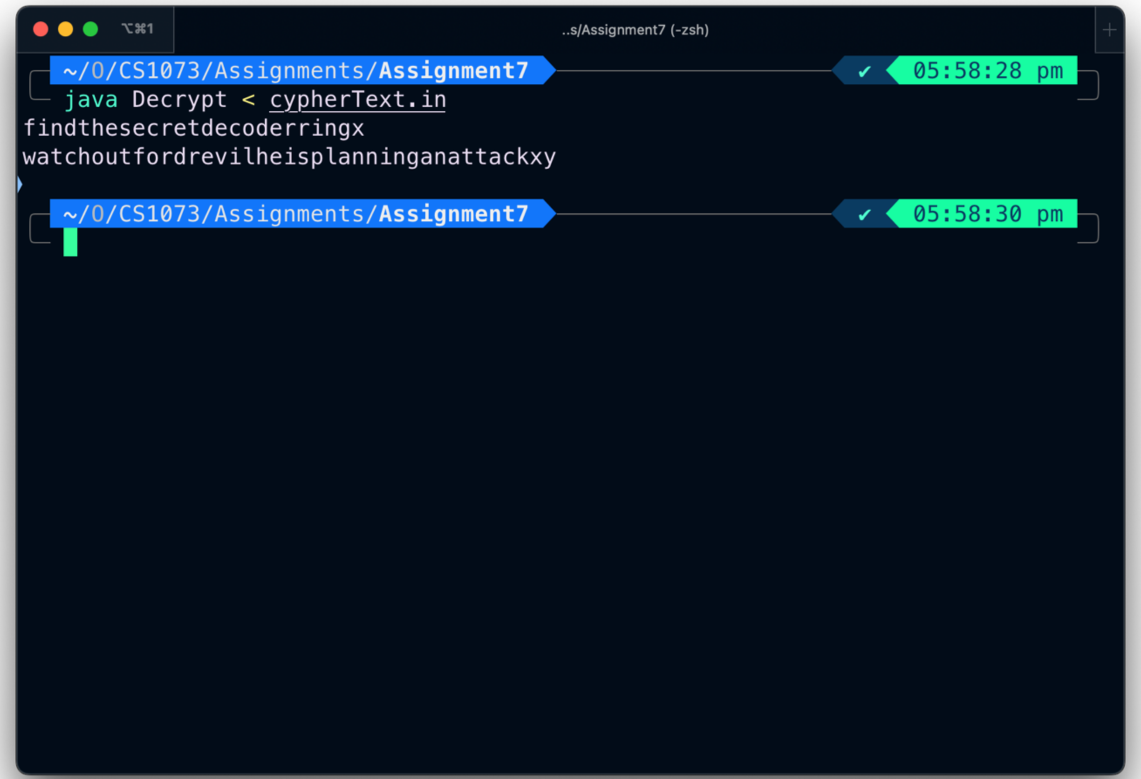
Question 1:

```
import java.util.Scanner;
/**
 * This class represents a decryption algorithm
@author Daniyal Khan 3765942
*/
public class Decrypt {
    public static void main(String[] args) {
        Scanner read = new Scanner(System.in);

        String msg; // user input
        int columns;  //
        int iterateStr = 0;
        boolean alternate = true;

        columns = read.nextInt();
        read.nextLine(); // consumes newline character
        msg = read.next();

        int rows = msg.length() / columns;
        String[][] patternArray = new String[rows][columns]; //
2D array for entering numbers for making up the encryption
pattern

        while(columns != 0) {
            for (int j = 0; j < patternArray[0].length; j++) {
                if (alternate){  // reading the encrypted msg
and then storing the char into the 2D array alternating from
bottom to top and top to bottom
                    for (int i = patternArray.length - 1; i >=
0; i--) {
                    patternArray[i][j] = "" +
msg.charAt(iterateStr++);
                    }
                    alternate = !alternate;
                } else {
                    for (int i = 0; i < patternArray.length;
i++) {
                        patternArray[i][j] = "" +
msg.charAt(iterateStr++);
                    }
                    alternate = !alternate;
                }
            }
            iterateStr = 0;
            System.out.println(decrypt(patternArray));

            // NEXT INPUT
            columns = read.nextInt();
            // read.nextLine(); // consumes newline character
            if (columns != 0) {
                msg = read.next();
                rows = msg.length() / columns;
                patternArray = new String[rows][columns]; // new
2D array for the next encrypted msg
                alternate = true;
            }
        }
    }

    public static String decrypt(String[][] array) {
        boolean alternate = true;
        String decryptedMsg = "";
        for (int i = 0; i < array.length; i++) { // alternating
from left to right and right to left in the 2D array and then
storing into String
            if(alternate) {
                for (int j = 0; j < array[0].length; j++) {
                    decryptedMsg += array[i][j];
                }
                alternate = !alternate;
            } else {
                for (int j = array[0].length - 1; j >= 0 ; j--)
{
                    decryptedMsg += array[i][j];
                }
                alternate = !alternate;
            }
        }
        return decryptedMsg;
    }

    public static void printPartialArray(int companionVar,
String[] array) {
        for(int i = 0; i < companionVar; i++) {
            System.out.println(array[i]);
        }
    }

    public static void print2DArray(String[][] array) {
        for(int i = 0; i < array.length; i++) {
            for(int j = 0; j < array[0].length; j++) {
                System.out.print(array[i][j] + " ");
            }
            System.out.println();
        }
    }
}
```

Output:



```
~/0/CS1073/Assignments/Assignment7                    ✔  05:58:28 pm
 java Decrypt < cypherText.in
findthesecretdecoderringx
watchoutfordrevilheisplanninganattackxy

~/0/CS1073/Assignments/Assignment7                    ✔  05:58:30 pm
```

Question 2:

SpellCaster:

```
/**
This class represents a Spell Caster
@author Daniyal Khan 3765942
*/

public class SpellCaster{
    /**
     * Name of the spell caster
     */
    private final String name;

    /**
     * Level of the spell caster
     */
    private final int level;

    /**
     * Guild membership number of the spell caster
     */
    private final int guildMembershipNumber;

    /**
     * ID varaible for incrementing the guild memberhsip number
everytime a new Spell Caster is added
     */
    private static int ID = 6000;

    /**
     * Spell book of the spell caster
     */
    private Spell[] spellBook;

    /**
     * Max number of spells a spell caster can hold in the spell
bookjavadoc -author -private -d SpellCaster.java
     */
    private final int NUM_SPELLS = 7;

    /**
```

```
     * Constructs an object of type SpellCaster
     * @param name Name of the Spell Caster
     * @param level Level of the Spell Caster
     */
    public SpellCaster(String name, int level) {
        this.name = name;
        this.level = level;
        guildMembershipNumber = ID; // assigning guild number
and changing the ID static variable everytime
        ID++;
        spellBook = new Spell[0]; // starting size of Spell Book
is zero
    }

    /**
     * Returns name of the spell caster
     * @return name of the spell caster
     */
    public String getName() {
        return name;
    }

    /**
     * Returns level of the spell caster
     * @return level of the spell caster
     */
    public int getLevel() {
        return level;
    }

    /**
     * Returns the guild membership id of the spell caster
     * @return guild membership id of the spell caster
     */
    public int getMembershipNum() {
        return guildMembershipNumber;
    }

    /**
     * Returns the entire spell book of the spell caster
     * @return spell book of the spell caster
     */
    public Spell[] getSpellBook() {
        Spell[] copySpellBook = new Spell[spellBook.length];
        for (int i = 0; i < spellBook.length - 1; i++) {
            copySpellBook[i] = spellBook[i];
        }
        return spellBook;
    }

    /**
     * Adds a spell to the spell book of the spell caster
     * @param spell spell to be added to the spell book
     * @return true if spell gets added succesfully, false
otherwise
     */
    public boolean addSpell(Spell spell) {
        boolean added = false;

        if (spell.getLevel() <= level && spellBook.length <
NUM_SPELLS) {
            Spell[] newSpellBook = new
Spell[spellBook.length+1]; // whenever adding a new spell,
create a new array +1 the size of the previous one
            System.arraycopy(spellBook, 0, newSpellBook, 0,
spellBook.length); // copy all the elements of the previous to
new
            newSpellBook[newSpellBook.length-1] = spell;
            spellBook = newSpellBook;
            added = true;
        }
        return added;
    }

    /**
     * Casts/removes the spell from the spell book of the spell
caster
     * @param spell spell to be casted from the spell book
     * @return true if the spell gets casted successfully, false
otherwise
     */
    public boolean castSpell(Spell spell) {
        boolean cast = false;
        for (int i = 0; i < spellBook.length && cast != true;
i++) {
            if (spellBook[i].equals(spell)) {
                spellBook[i] = spellBook[spellBook.length-1];
                Spell[] newSpellBook = new
Spell[spellBook.length-1]; // when spell gets casted, create a
new array -1 the size of the previous one
                System.arraycopy(spellBook, 0, newSpellBook, 0,
spellBook.length-1); // copy one less element of the previous
array
                spellBook = newSpellBook;
                cast = true;
            }
        }
        return cast;
    }
}
```

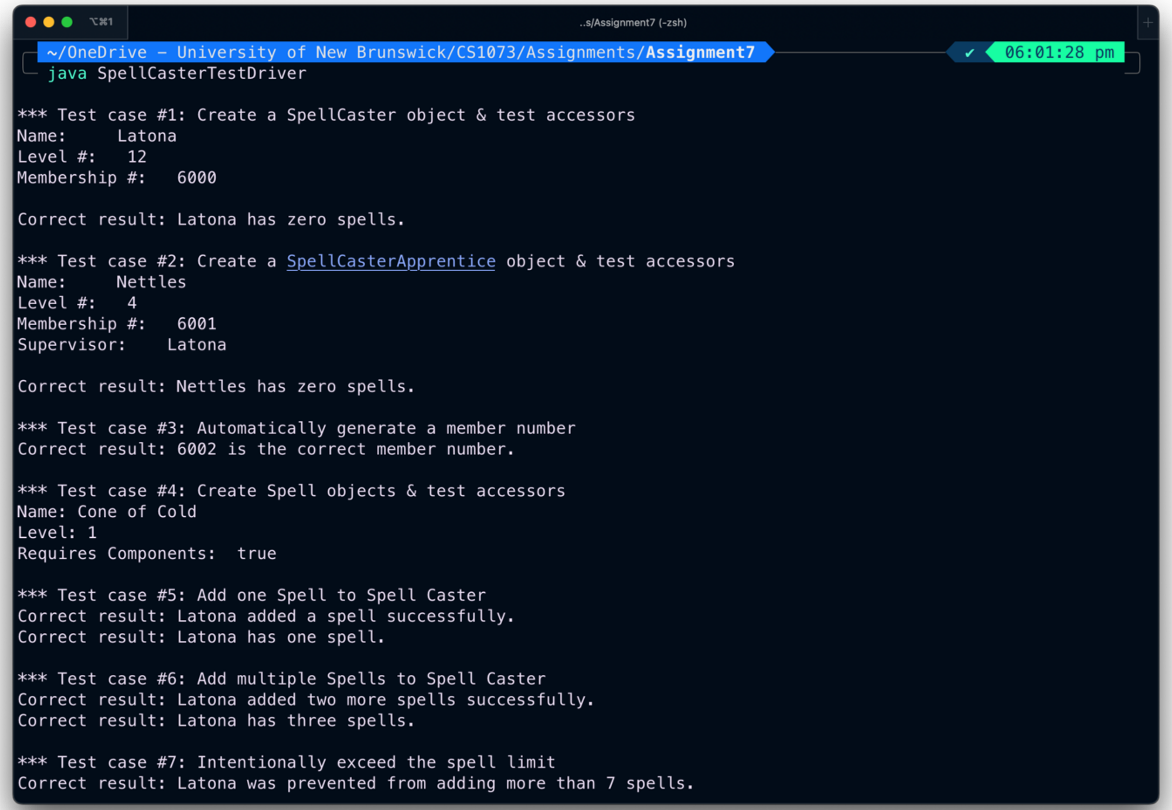
SpellCasterApprentice:

```
/**
This class represents a Spell Caster Apprentice
@author Daniyal Khan 3765942
*/
public class SpellCasterApprentice extends SpellCaster {
    /**
     * Supervisor of the apprentice
     */
    private SpellCaster supervisor;

    /**
     * Contructs an object of type SpellCasterApprentice
     * @param name Name of the apprentice
     * @param level Level of the apprentice
     * @param supervisor Supervisor of the apprentice
     */
    public SpellCasterApprentice(String name, int level,
SpellCaster supervisor) {
        super(name, level);
        this.supervisor = supervisor;
    }

    /**
     * Returns the supervisor of the apprentice
     * @return Supervisor of the apprentice
     */
    public SpellCaster getSupervisor() {
        return supervisor;
    }

    /**
     * @param spell Spell to be added
     * @return true if added successfully, otherwise false
     */
    public boolean addSpell(Spell spell) {
        boolean added = false;
        if(spell.hasComponents()) {
            added = false;
        } else {
            added = super.addSpell(spell);
        }
        return added;
    }
}
```

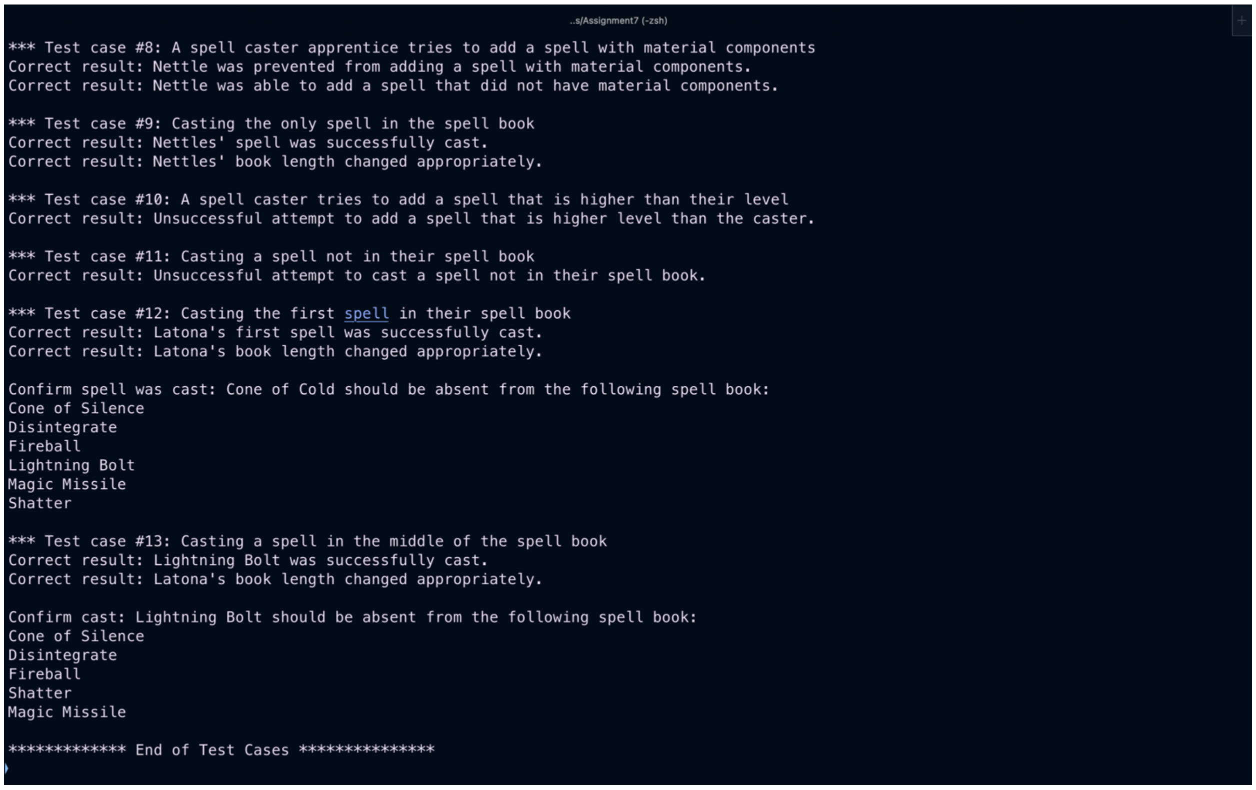
Spell:

```
/**
 * This class represents a Spell
@author Daniyal Khan 3765942
*/
public class Spell{
    /**
     * Name of the spell
     */
    private final String name;

    /**
     * Level of the spell
     */
    private final int level;

    /**
     * Material Comp, if the spell has it
     */
    private final boolean materialComps;
    /**
     * Constructs a object of type Spell
     * @param name name of the spell
     * @param level level of the spell
     * @param materialComps if it has a material component
     */
    public Spell(String name, int level, boolean materialComps)
{
        this.name = name;
        this.level = level;
        this.materialComps = materialComps;
    }

    /**
     * Returns the name of the spell
     * @return Name of the spell
     */
    public String getName() {
        return name;
    }

    /**
     * Returns the level of the spell
     * @return Level of the spell
     */
    public int getLevel() {
        return level;
    }

    /**
     * Returns if the spell has a material component
     * @return Material component true or false
     */
    public boolean hasComponents() {
        return materialComps;
    }

    /**
     * Returns if two spells are equal
     * @param spellBook Spell to compare with
     * @return Spell equal if true or false
     */
    public boolean equals(Spell spellBook) {
        return spellBook.name == name
                && spellBook.level == level
                &&  spellBook.materialComps == materialComps;

    }
}
```

Output:



```
~/OneDrive - University of New Brunswick/CS1073/Assignments/Assignment7                ✔  06:01:28 pm
 java SpellCasterTestDriver

*** Test case #1: Create a SpellCaster object & test accessors
Name:     Latona
Level #:   12
Membership #:   6000

Correct result: Latona has zero spells.

*** Test case #2: Create a SpellCasterApprentice object & test accessors
Name:     Nettles
Level #:   4
Membership #:   6001
Supervisor:    Latona

Correct result: Nettles has zero spells.

*** Test case #3: Automatically generate a member number
Correct result: 6002 is the correct member number.

*** Test case #4: Create Spell objects & test accessors
Name: Cone of Cold
Level: 1
Requires Components:  true

*** Test case #5: Add one Spell to Spell Caster
Correct result: Latona added a spell successfully.
Correct result: Latona has one spell.

*** Test case #6: Add multiple Spells to Spell Caster
Correct result: Latona added two more spells successfully.
Correct result: Latona has three spells.

*** Test case #7: Intentionally exceed the spell limit
Correct result: Latona was prevented from adding more than 7 spells.
```


..s/Assignment7 (-zsh)

```
*** Test case #8: A spell caster apprentice tries to add a spell with material components
Correct result: Nettle was prevented from adding a spell with material components.
Correct result: Nettle was able to add a spell that did not have material components.

*** Test case #9: Casting the only spell in the spell book
Correct result: Nettles' spell was successfully cast.
Correct result: Nettles' book length changed appropriately.

*** Test case #10: A spell caster tries to add a spell that is higher than their level
Correct result: Unsuccessful attempt to add a spell that is higher level than the caster.

*** Test case #11: Casting a spell not in their spell book
Correct result: Unsuccessful attempt to cast a spell not in their spell book.

*** Test case #12: Casting the first spell in their spell book
Correct result: Latona's first spell was successfully cast.
Correct result: Latona's book length changed appropriately.

Confirm spell was cast: Cone of Cold should be absent from the following spell book:
Cone of Silence
Disintegrate
Fireball
Lightning Bolt
Magic Missile
Shatter

*** Test case #13: Casting a spell in the middle of the spell book
Correct result: Lightning Bolt was successfully cast.
Correct result: Latona's book length changed appropriately.

Confirm cast: Lightning Bolt should be absent from the following spell book:
Cone of Silence
Disintegrate
Fireball
Shatter
Magic Missile

************* End of Test Cases ***************
```