# SHEET 4 SOLUTIONS

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**GENERAL NOTE**: to **copy** code **from** this PDF document, **copy each block of code** separately to **not** lose the code's formatting, alternatively you can find all the **source code** to **PROGRAMMING EXERCISES** on my **GitHub**: https://bit.ly/CSE231Sheets , **happy compiling!**

1. Our driver program will be in BookStore.java, we have two inheriting classes, `TextBook` and `AudioBook`, structured as follows:

```
.
├── BookStore.java
├── TextBook.java
└── AudioBook.java
```

**TextBook.java**

```java
public class TextBook extends BookStore {
    int numPages;
    public double getNumPages() {
        return numPages;
    }
    public void setNumPages(int numPages) {
        this.numPages = numPages;
    }
}
```

**AudioBook.java**

```java
public class AudioBook extends BookStore {
    int lenInPages;
    public double getLenInPages() {
        return lenInPages;
    }
    public void setLenInPages(int lenInPages) {
        this.lenInPages = lenInPages;
    }
}
```

**BookStore.java**

```java
import java.util.ArrayList;
import java.util.List;
import java.util.Scanner;
import java.time.LocalDate;
public class BookStore {
    private static int nextId = 1; // Static counter for unique IDs
    int ID;
    String Title;
    LocalDate releaseDate;
    double price;
    boolean type;

    public String isType() {
```

```
        if (type == true){
            return "textbook";
        } else {
            return "audiobook";
        }
    }
    public void setType(boolean type) {
        this.type = type;
    }

    public BookStore(){
        this.ID = nextId; // Assign unique ID from the counter
        nextId++; // Increment the counter for the next object
    }

    public int getId() {
        return ID;
    }

    public String getTitle() {
        return Title;
    }

    public void setTitle(String title) {
        Title = title;
    }

    public LocalDate getReleaseDate() {
        return releaseDate;
    }

    public void setReleaseDate(LocalDate releaseDate) {
        this.releaseDate = releaseDate;
    }

    public double getPrice() {
        return price;
    }

    public void setPrice(double price) {
        this.price = price;
    }

    public static void main(String[] args){
        Scanner input = new Scanner(System.in);
        System.out.println("How many books are you providing?");
        int books = input.nextInt();
        int[] numBooks = new int[books];
        List <BookStore> bookList = new ArrayList<BookStore>();
        for (int i = 0; i < numBooks.length; i++){
            System.out.println("Book " + (i + 1) + ":");
            System.out.println("Type\n(1) for a TextBook\n(2) for an
AudioBook");
            int bookType = input.nextInt();
            if (bookType == 1){
```

```
                TextBook newTextBook = new TextBook();
                newTextBook.setType(true);
                System.out.println("What is the title of your TextBook?");
                input.nextLine();  // consume the leftover newline
                newTextBook.setTitle(input.nextLine());
                System.out.println("What is the release date of your
TextBook? (Write in the format of YYYY-MM-DD)");
                newTextBook.setReleaseDate(LocalDate.parse(input.next()));
                System.out.println("What is the price of your TextBook?");
                newTextBook.setPrice(input.nextDouble());
                System.out.println("How many pages does your TextBook
have?");
                newTextBook.setNumPages(input.nextInt());
                bookList.add(newTextBook);
            } else if (bookType == 2){
                AudioBook newAudioBook = new AudioBook();
                newAudioBook.setType(false);
                System.out.println("What is the title of your AudioBook?");
                input.nextLine();  // consume the leftover newline
                newAudioBook.setTitle(input.nextLine());
                System.out.println("What is the release date of your
AudioBook? (Write in the format of YYYY-MM-DD)");
                newAudioBook.setReleaseDate(LocalDate.parse(input.next()));
                System.out.println("What is the price of your AudioBook?");
                newAudioBook.setPrice(input.nextDouble());
                System.out.println("What is the length of your AudioBook in
minutes?");
                newAudioBook.setLenInPages(input.nextInt());
                bookList.add(newAudioBook);

            }
        }
        System.out.println("\nEntered Books:");
        for (BookStore book : bookList) {
            System.out.println("ID: " + book.getId()); // Print ID
            System.out.println("Title: " + book.getTitle());
            System.out.println("Release Date: " + book.getReleaseDate());
            System.out.println("Price: $" + book.getPrice());

            if (book.isType().equalsIgnoreCase("textbook")) {
                System.out.println("Number of Pages: " + ((TextBook)
book).getNumPages());
            } else {
                System.out.println("Length (minutes): " + ((AudioBook)
book).getLenInPages());
            }

            System.out.println("====================================");
        }
        input.close();
    }

}
```

The output for the driver program *(after taking inputs)* would be:

```
Entered Books:
ID: 1
Title: Pride and Prejudice
Release Date: 1813-01-28
Price: $9.99
Number of Pages: 384.0
==================================
ID: 2
Title: The Hitchhiker's Guide to the Galaxy
Release Date: 1979-10-12
Price: $24.99
Length (minutes): 330.0
==================================
ID: 3
Title: To Kill a Mockingbird
Release Date: 1960-07-11
Price: $12.99
Number of Pages: 281.0
==================================
ID: 4
Title: Sapiens: A Brief History of Humankind
Release Date: 2015-02-10
Price: $14.99
Length (minutes): 480.0
==================================
```

2. In the second problem, we are required to modify the **BookStore** class to include `toString` methods and a printing method to better incorporate polymorphism, our new driver class would be called `BookStoreModified.java` and consequently its inheritors would be `TextBookModified.java` and `AudioBookModified.java`.

*In this exercise, I've added **print** methods to the getters of each class in addition to a printing method for the bookstore, and a **toString** method as well.*

**TextBookModified.java**

```java
public class TextBookModified extends BookStoreModified {
    int numPages;
    public double getNumPages() {
        // print the number of pages of the object
        System.out.println("Number of Pages: " + numPages);
        // return the number of pages of the object
        return numPages;
    }
    public void setNumPages(int numPages) {
        this.numPages = numPages;
    }

    @Override
    public String toString() {
        return "ID: " + ID + "\nTitle: " + Title + "\nRelease Date: " +
releaseDate + "\nPrice: " + price + "\nNumber of Pages: " + numPages;
    }

    @Override
```

```
    public void print() {
        System.out.println("ID: " + ID + "\nTitle: " + Title + "\nRelease
Date: " + releaseDate + "\nPrice: " + price + "\nNumber of Pages: " +
numPages);
    }

}
```

**AudioBookModified.java**

```
public class AudioBookModified extends BookStoreModified {
    int lenInPages;
    public double getLenInPages() {
        // print the length in pages of the object
        System.out.println("Length in Pages: " + lenInPages);
        // return the length in pages of the object
        return lenInPages;
    }
    public void setLenInPages(int lenInPages) {
        this.lenInPages = lenInPages;
    }

    @Override
    public String toString() {
        return "ID: " + ID + "\nTitle: " + Title + "\nRelease Date: " +
releaseDate + "\nPrice: " + price + "\nLength in Pages: " + lenInPages;
    }

    @Override
    public void print() {
        System.out.println("ID: " + ID + "\nTitle: " + Title + "\nRelease Date: "
+ releaseDate + "\nPrice: " + price + "\nLength in Pages: " + lenInPages);
    }
}
```

**BookStoreModified.java**

```
import java.util.ArrayList;
import java.util.List;
import java.util.Scanner;
import java.time.LocalDate;
public class BookStoreModified {
    private static int nextId = 1; // Static counter for unique IDs
    int ID;
    String Title;
    LocalDate releaseDate;
    double price;
    boolean type;
    public String isType() {
        if (type == true){
            return "textbook";
        } else {
            return "audiobook";
        }
    }
    public void setType(boolean type) {
        this.type = type;
    }
    public BookStoreModified(){
        this.ID = nextId; // Assign unique ID from the counter
        nextId++; // Increment the counter for the next object
```

```
    }
    public int getId() {
        // print the ID of the object
        System.out.println("ID: " + ID);
        // return the ID of the object
        return ID;
    }
    public String getTitle() {
        // print the title of the object
        System.out.println("Title: " + Title);
        // return the title of the object
        return Title;
    }
    public void setTitle(String title) {
        Title = title;
    }
    public LocalDate getReleaseDate() {
        // print the release date of the object
        System.out.println("Release Date: " + releaseDate);
        // return the release date of the object
        return releaseDate;
    }

    public void setReleaseDate(LocalDate releaseDate) {
        this.releaseDate = releaseDate;
    }
    public double getPrice() {
        // print the price of the object
        System.out.println("Price: " + price);
        // return the price of the object
        return price;
    }
    public void setPrice(double price) {
        this.price = price;
    }

    // toString method to print the object
    public String toString() {
        return "ID: " + ID + "\nTitle: " + Title + "\nRelease Date: " +
releaseDate + "\nPrice: " + price;
    }

    // Equals method to compare objects
    public boolean equals(BookStoreModified book) {
        if (this.ID == book.ID) {
            return true;
        } else {
            return false;
        }
    }

    // Print method to print the object
    public void print() {
        System.out.println("ID: " + ID + "\nTitle: " + Title + "\nRelease Date: "
+ releaseDate + "\nPrice: " + price);
    }

    public static void main(String[] args){
        Scanner input = new Scanner(System.in);
        System.out.println("How many books are you providing?");
```

```
        int books = input.nextInt();
        int[] numBooks = new int[books];
        List <BookStoreModified> bookList = new ArrayList<BookStoreModified>();
        for (int i = 0; i < numBooks.length; i++){
            System.out.println("Book " + (i + 1) + ":");
            System.out.println("Type\n(1) for a TextBook\n(2) for an AudioBook");
            int bookType = input.nextInt();
            if (bookType == 1){
                TextBookModified newTextBook = new TextBookModified();
                newTextBook.setType(true);
                System.out.println("What is the title of your TextBook?");
                input.nextLine();  // consume the leftover newline
                newTextBook.setTitle(input.nextLine());
                System.out.println("What is the release date of your TextBook?
(Write in the format of YYYY-MM-DD)");
                newTextBook.setReleaseDate(LocalDate.parse(input.next()));
                System.out.println("What is the price of your TextBook?");
                newTextBook.setPrice(input.nextDouble());
                System.out.println("How many pages does your TextBook have?");
                newTextBook.setNumPages(input.nextInt());
                bookList.add(newTextBook);
            } else if (bookType == 2){
                AudioBookModified newAudioBook = new AudioBookModified();
                newAudioBook.setType(false);
                System.out.println("What is the title of your AudioBook?");
                input.nextLine();  // consume the leftover newline
                newAudioBook.setTitle(input.nextLine());
                System.out.println("What is the release date of your AudioBook?
(Write in the format of YYYY-MM-DD)");
                newAudioBook.setReleaseDate(LocalDate.parse(input.next()));
                System.out.println("What is the price of your AudioBook?");
                newAudioBook.setPrice(input.nextDouble());
                System.out.println("What is the length of your AudioBook in
minutes?");
                newAudioBook.setLenInPages(input.nextInt());
                bookList.add(newAudioBook);

            }
        }
        System.out.println("\nEntered Books:");
        // using the getters to print the objects
        for (int i = 0; i < bookList.size(); i++){
            System.out.println(bookList.get(i));
        }
       /* // using the print method to print the objects
        for (int i = 0; i < bookList.size(); i++){
            bookList.get(i).print();
        } */
        input.close();
    }

}
```

**This concludes Sheet (4) Solutions, this document + source code to all programming exercises available on** https://bit.ly/CSE231Sheets **.**