

* title: java CA
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* date: 23 Nov 2023

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a. IPO

IPO		
input	process	output
String title	printSmallestDurationMovie()	smallestDuration
int duration	printLongestDurationMovie()	longestDuration
Double rating		averageDuration
int yearOfRelease	printAverageDuration()	myLoop
int selection		Movie details (title, duration, rating, yearOfRelease)

1. input

- * String title refers to the title of movie.
- * int duration refers to time length of movie.
- * Double rating refers to the rates of movie.
- * int YearOfRelease refers to the year of released.
- * selection is show in switch...case syntax for select branch.

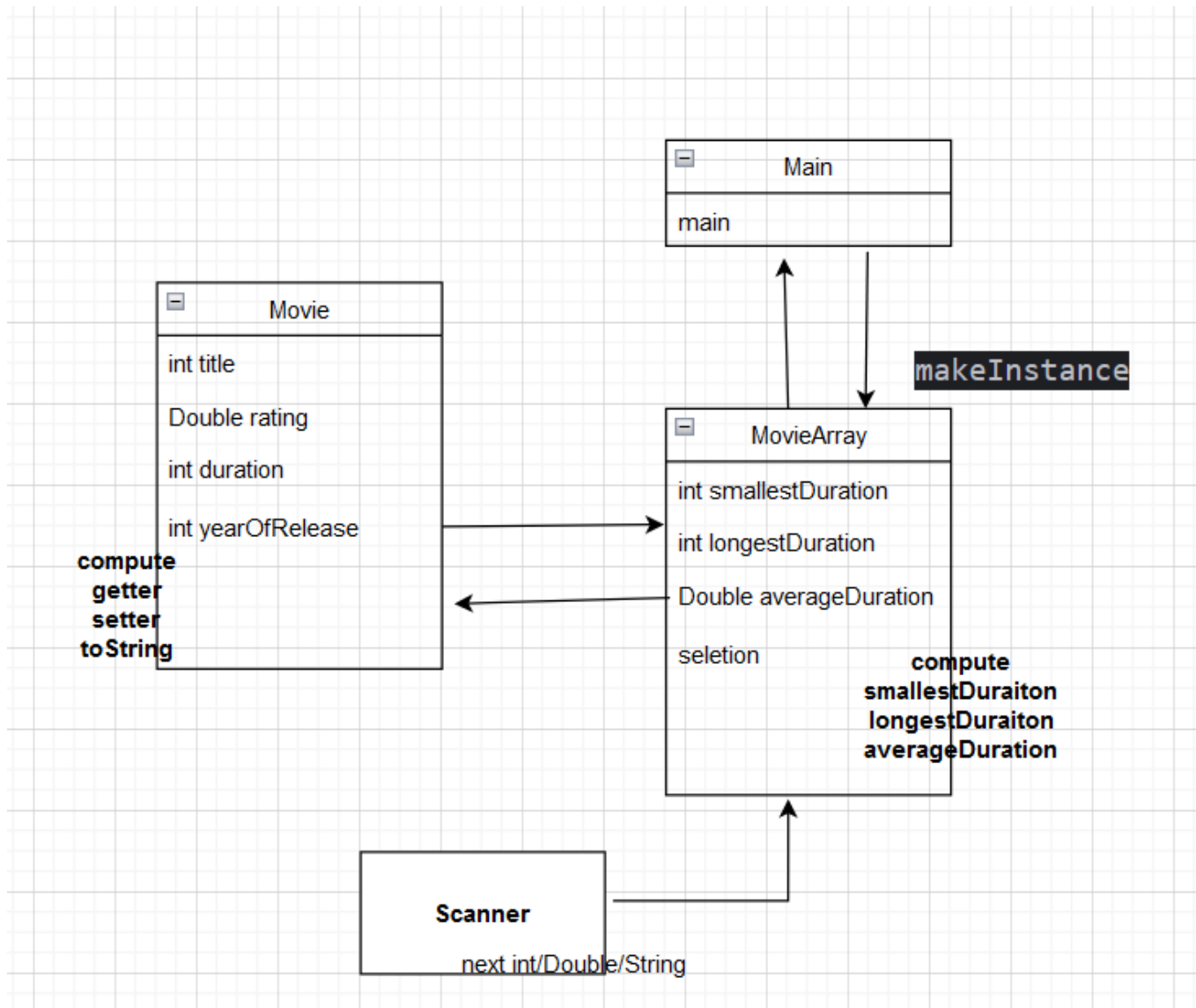
2. main processing

- * printSmallestDuration() is used to calculate the smallest duration and referred i
- * printLongestDuration() is used to calculate the longest duration and referred ins
- * printAverageDuration() is used to calculate average duration of all items.

3. output

- * smallestDuration refers to the smallest the duration itself and the referred item
- * longestDuration refers to the longest the duration itself and the referred item.
- * averageDuration refers to the average duration of all items.
- * myLoop() is the function contained loop and switch branch that user can select.
- * Movie details (title, duration, rating, yearOfRelease)

b. Class diagram



c. decisions that taken in designing and implementing

- * In my case, overall thinking is one Movie class is needed to wrap all relevant fi and functions.
- * Another MovieArray class is used to contain loads of Movie instances and relevant

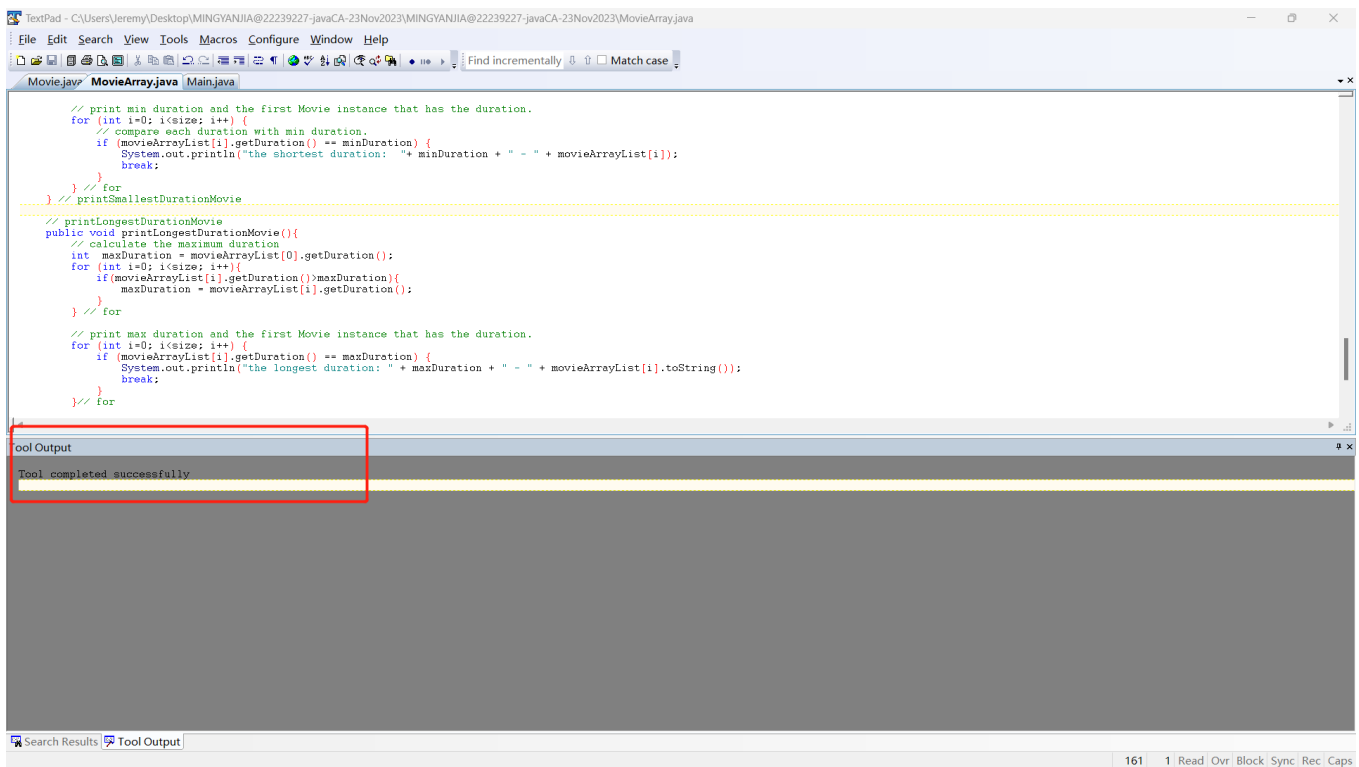
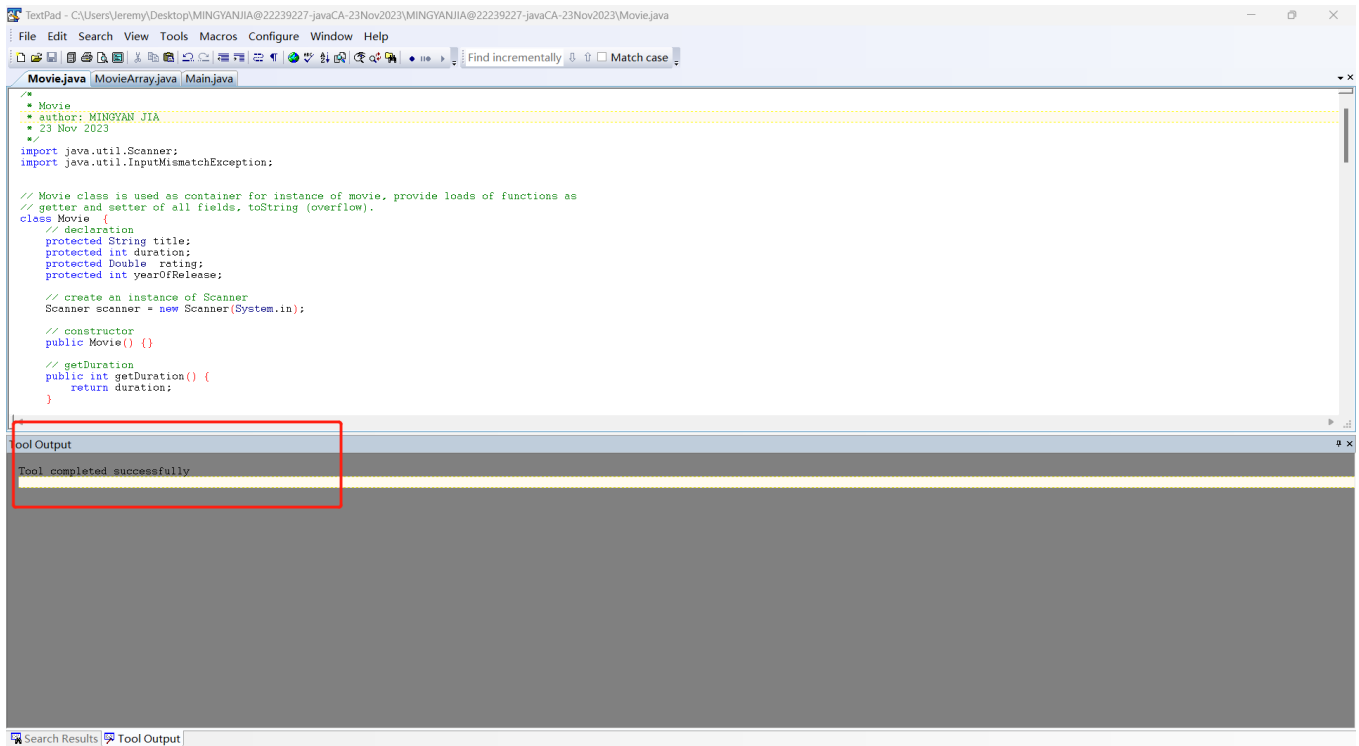
function.

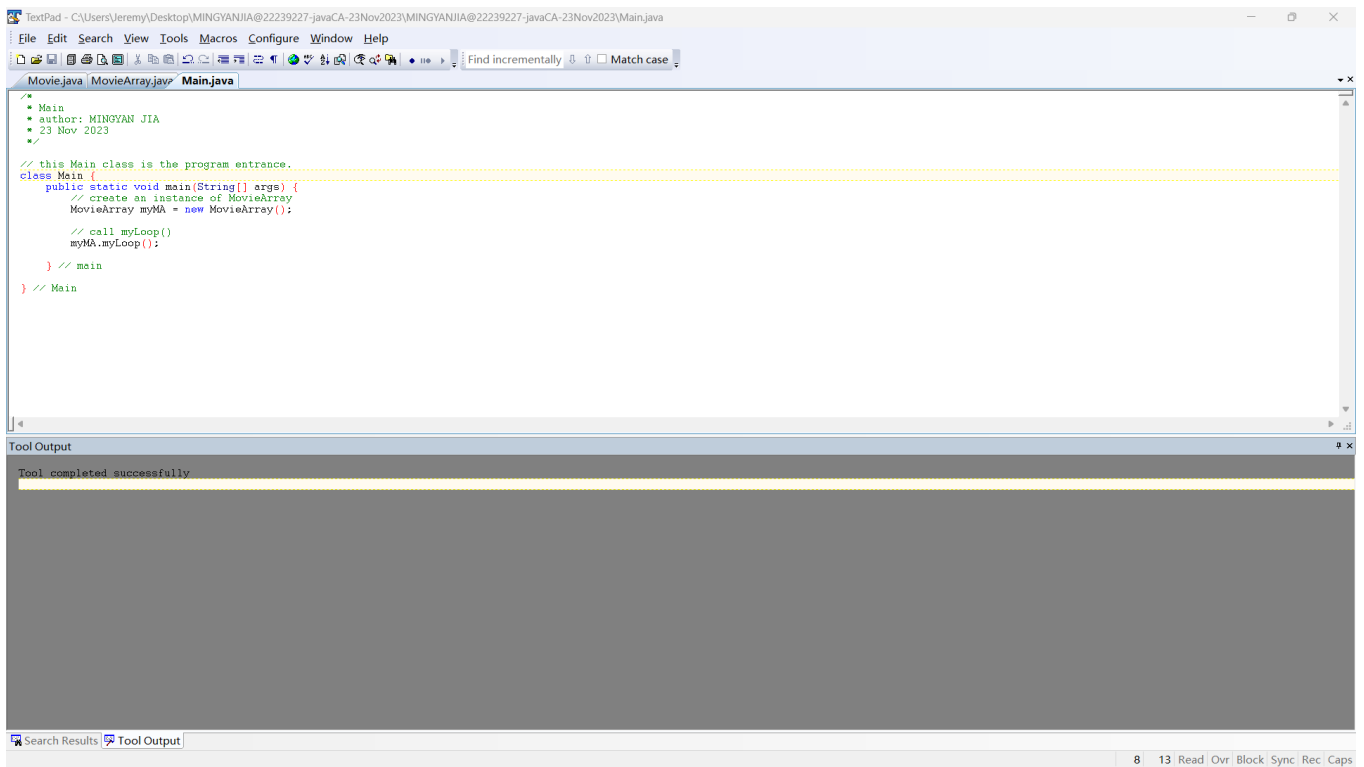
- * Main class is the entrance to run the script.
- * Exception is needed to make codes stronger.

d. Source code explanation

- * In Movie class, there are several getter and setter function to set and get field
- * Additional, `intInput()`, `doubleInput()`, `stringInput()` are used to pass different t data to instance
- * In MovieApp class, `myLoop()` is used to provide user to select branch
- * Additional, `makeInstance()` is used to create a new Movie instance when called.
- * `printSmallestDurationMovie()`, `printLongestDurationMovie()`, `printAverageDuration()` used to print min, max, avg.
- * exception (`try..catch`) is used to catch the error when unmatched type is entered

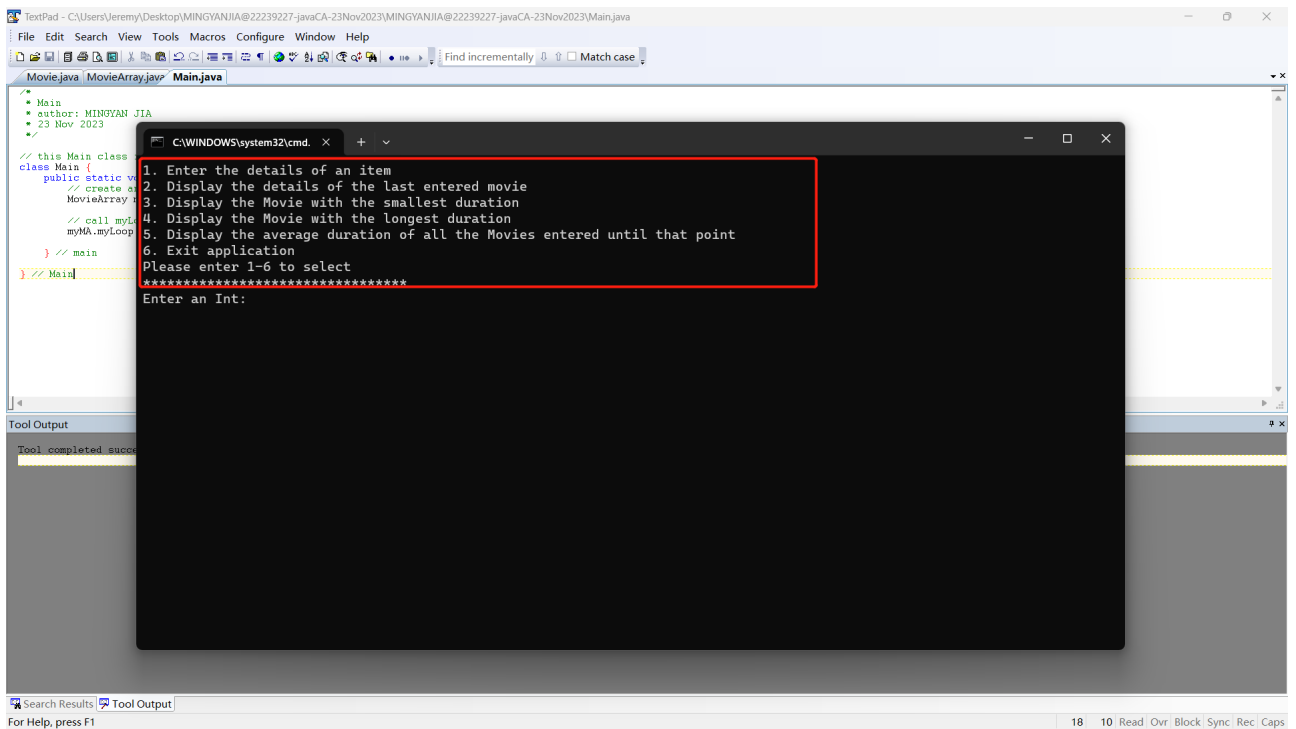
e.1 compile



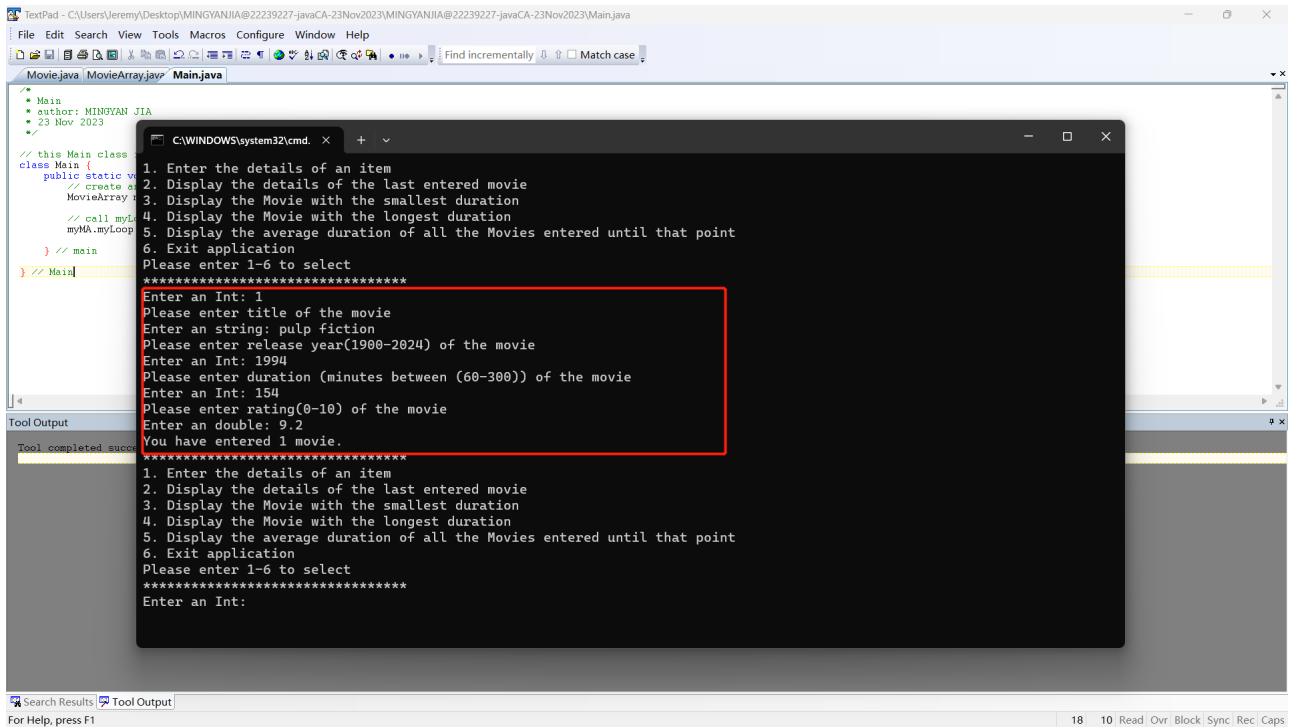


e.2 run main()

1. when call the main()



2. enter items



```
TextPad - C:\Users\Jeremy\Desktop\MINGYANJIA@22239227-javaCA-23Nov2023\MINGYANJIA@22239227-javaCA-23Nov2023\Main.java
File Edit Search View Tools Macros Configure Window Help
Movie.java MovieArray.java Main.java
//
// Main
// author: MINGYAN JIA
// 23 Nov 2023
//
// this Main class
class Main {
    public static void main (String[] args) {
        // create a
        MovieArray myMA = new MovieArray();
        // call myMA
        myMA.myLoop();
    } // main
} // Main

1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 1
Please enter title of the movie
Enter an string: pulp fiction
Please enter release year(1900-2024) of the movie
Enter an Int: 1994
Please enter duration (minutes between (60-300)) of the movie
Enter an Int: 154
Please enter rating(0-10) of the movie
Enter an double: 9.2
You have entered 1 movie.
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int:
```

Tool Output

Tool completed successfully

Search Results | Tool Output

For Help, press F1

18 10 Read Ovr | Block Sync | Rec | Caps

TextPad - C:\Users\Jeremy\Desktop\MINGYANJIA@22239227-javaCA-23Nov2023\MINGYANJIA@22239227-javaCA-23Nov2023\Main.java

File Edit Search View Tools Macros Configure Window Help

Find incrementally Match case

Movie.java MovieArray.java Main.java

```

*
* Main
* author: MINGYAN JIA
* 23 Nov 2023
*
// this Main class
class Main {
    public static void main (String[] args) {
        // create a MovieArray
        MovieArray myMA = new MovieArray();
        // call myMA.myLoop
        myMA.myLoop();
    } // main
} // Main

```

Tool Output

Tool completed successfully

C:\WINDOWS\system32\cmd.exe

```

You have entered 1 movie.
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 1
Please enter title of the movie
Enter an string: forrest gump
Please enter release year(1900-2024) of the movie
Enter an Int: 1994
Please enter duration (minutes between (60-300)) of the movie
Enter an Int: 144
Please enter rating(0-10) of the movie
Enter an double: 9.4
You have entered 2 movie.
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int:

```

Search Results Tool Output

For Help, press F1

18 10 Read Ovr Block Sync Rec Caps

TextPad - C:\Users\Jeremy\Desktop\MINGYANJIA@22239227-javaCA-23Nov2023\MINGYANJIA@22239227-javaCA-23Nov2023\Main.java

File Edit Search View Tools Macros Configure Window Help

Find incrementally Match case

Movie.java MovieArray.java Main.java

```

*
* Main
* author: MINGYAN JIA
* 23 Nov 2023
*
// this Main class
class Main {
    public static void main (String[] args) {
        // create a MovieArray
        MovieArray myMA = new MovieArray();
        // call myMA.myLoop
        myMA.myLoop();
    } // main
} // Main

```

Tool Output

Tool completed successfully

C:\WINDOWS\system32\cmd.exe

```

You have entered 2 movie.
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 1
Please enter title of the movie
Enter an string: braveheart
Please enter release year(1900-2024) of the movie
Enter an Int: 1995
Please enter duration (minutes between (60-300)) of the movie
Enter an Int: 178
Please enter rating(0-10) of the movie
Enter an double: 8.9
You have entered 3 movie.
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int:

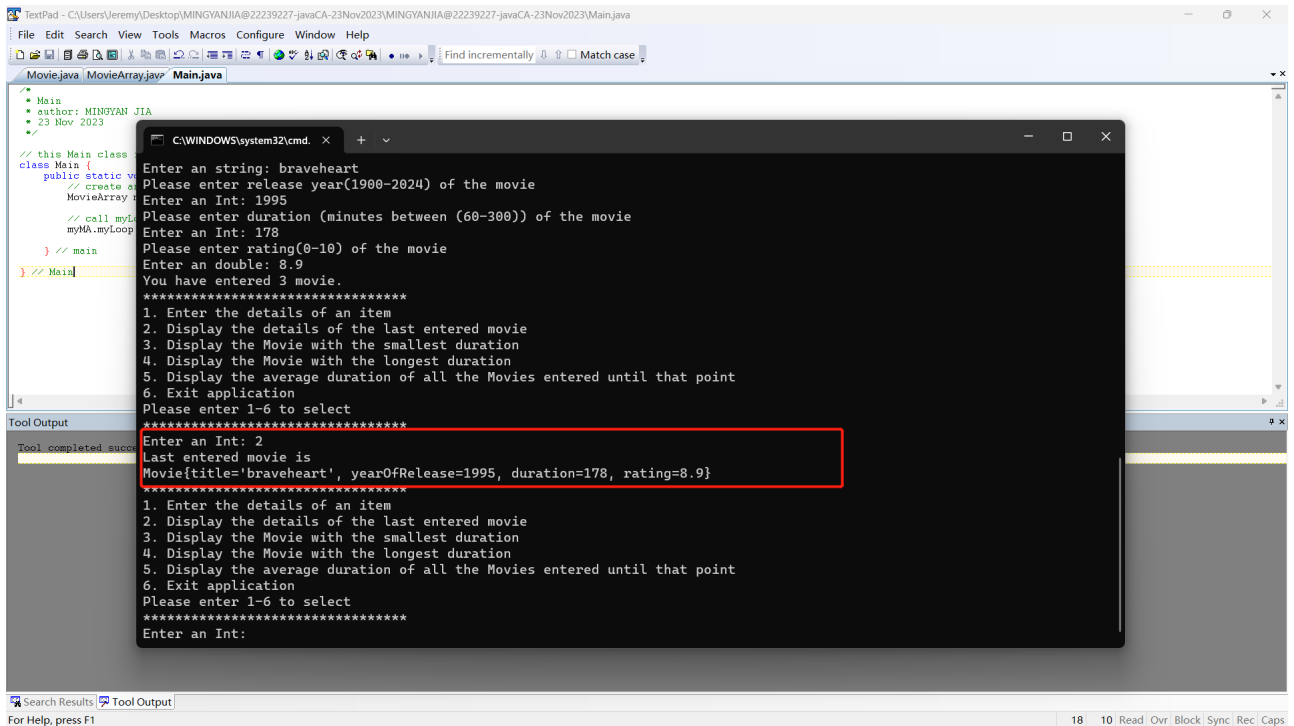
```

Search Results Tool Output

For Help, press F1

18 10 Read Ovr Block Sync Rec Caps

3. last item



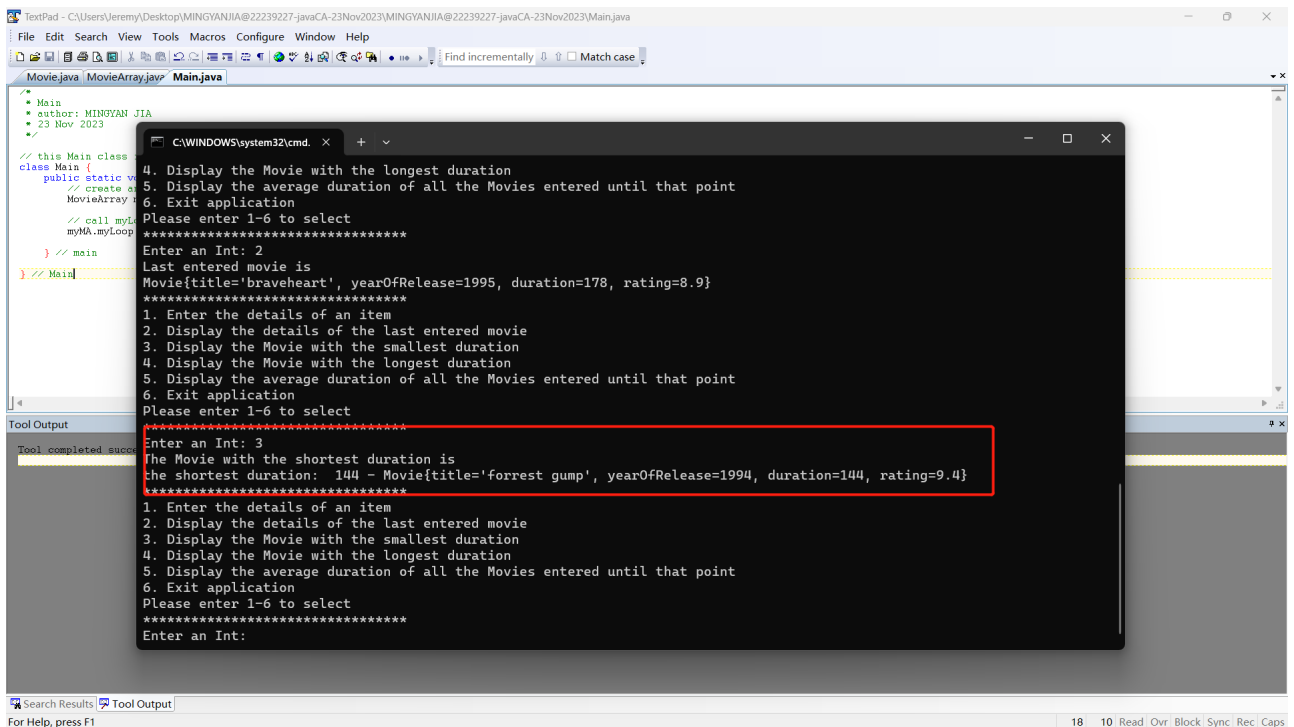
```
TextPad - C:\Users\Jeremy\Desktop\MINGYANJIA@22239227-javaCA-23Nov2023\MINGYANJIA@22239227-javaCA-23Nov2023\Main.java
File Edit Search View Tools Macros Configure Window Help
Movie.java MovieArray.java Main.java
Main
author: MINGYAN JIA
23 Nov 2023
// this Main class
class Main {
    public static void main (String[] args) {
        // create a MovieArray
        MovieArray myMA = new MovieArray();
        // call myMA.myLoop
        myMA.myLoop();
    } // main
} // Main

C:\WINDOWS\system32\cmd. x + v
Enter an string: braveheart
Please enter release year(1900-2024) of the movie
Enter an Int: 1995
Please enter duration (minutes between (60-300)) of the movie
Enter an Int: 178
Please enter rating(0-10) of the movie
Enter an double: 8.9
You have entered 3 movie.
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 2
Last entered movie is
Movie{title='braveheart', yearOfRelease=1995, duration=178, rating=8.9}
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int:

Tool Output
Tool completed successfully

Search Results | Tool Output
For Help, press F1 18 10 Read Ovr Block Sync Rec Caps
```

4. shortest



```
TextPad - C:\Users\Jeremy\Desktop\MINGYANJIA@22239227-javaCA-23Nov2023\MINGYANJIA@22239227-javaCA-23Nov2023\Main.java
File Edit Search View Tools Macros Configure Window Help
Movie.java MovieArray.java Main.java
Main
author: MINGYAN JIA
23 Nov 2023
// this Main class
class Main {
    public static void main (String[] args) {
        // create a MovieArray
        MovieArray myMA = new MovieArray();
        // call myMA.myLoop
        myMA.myLoop();
    } // main
} // Main

C:\WINDOWS\system32\cmd. x + v
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 2
Last entered movie is
Movie{title='braveheart', yearOfRelease=1995, duration=178, rating=8.9}
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 3
The Movie with the shortest duration is
the shortest duration: 144 - Movie{title='forrest gump', yearOfRelease=1994, duration=144, rating=9.4}
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int:

Tool Output
Tool completed successfully

Search Results | Tool Output
For Help, press F1 18 10 Read Ovr Block Sync Rec Caps
```

5. longest

```
TextPad - C:\Users\Jeremy\Desktop\MINGYANJIA@22239227-javaCA-23Nov2023\MINGYANJIA@22239227-javaCA-23Nov2023\Main.java
File Edit Search View Tools Macros Configure Window Help
Movie.java MovieArray.java Main.java
Main
author: MINGYAN JIA
23 Nov 2023
// this Main class
class Main {
    public static void main (String[] args) {
        // create a MovieArray
        MovieArray myMA = new MovieArray();
        // call myMA.myLoop
        myMA.myLoop();
    }
} // Main

C:\WINDOWS\system32\cmd. x
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 3
The Movie with the shortest duration is
the shortest duration: 144 - Movie{title='forrest gump', yearOfRelease=1994, duration=144, rating=9.4}
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 4
The Movie with the longest duration is
the longest duration: 178 - Movie{title='braveheart', yearOfRelease=1995, duration=178, rating=8.9}
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int:

Tool Output
Tool completed successfully

Search Results | Tool Output
For Help, press F1 18 10 Read Ovr Block Sync Rec Caps
```

6. average

```
TextPad - C:\Users\Jeremy\Desktop\MINGYANJIA@22239227-javaCA-23Nov2023\MINGYANJIA@22239227-javaCA-23Nov2023\Main.java
File Edit Search View Tools Macros Configure Window Help
Movie.java MovieArray.java Main.java
Main
author: MINGYAN JIA
23 Nov 2023
// this Main class
class Main {
    public static void main (String[] args) {
        // create a MovieArray
        MovieArray myMA = new MovieArray();
        // call myMA.myLoop
        myMA.myLoop();
    }
} // Main

C:\WINDOWS\system32\cmd. x
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 4
The Movie with the longest duration is
the longest duration: 178 - Movie{title='braveheart', yearOfRelease=1995, duration=178, rating=8.9}
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 5
Average duration of all the Movies is
158.66666666666666
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int:

Tool Output
Tool completed successfully

Search Results | Tool Output
For Help, press F1 18 10 Read Ovr Block Sync Rec Caps
```

7. enter another item with same duration as shortest item to demonstrate the first item is printed

```
TextPad - C:\Users\Jeremy\Desktop\MINGYANJIA@22239227-javaCA-23Nov2023\MINGYANJIA@22239227-javaCA-23Nov2023\Main.java
File Edit Search View Tools Macros Configure Window Help
Find incrementally Match case

Movie.java MovieArray.java Main.java
Main.java
Main
  Main
  author: MINGYAN JIA
  23 Nov 2023
  // this Main class
  class Main {
  public static void main (
  // create a
  MovieArray
  // call myLoop
  myMA.myLoop
  } // main
  } // Main

Tool Output
Tool completed successfully

C:\WINDOWS\system32\cmd.exe
You have entered 4 movie.
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 1
Please enter title of the movie
Enter an string: testShortest
Please enter release year(1900-2024) of the movie
Enter an Int: 1994
Please enter duration (minutes between (60-300)) of the movie
Enter an Int: 144
Please enter rating(0-10) of the movie
Enter an double: 9.4
You have entered 5 movie.
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int:
```

```
TextPad - C:\Users\Jeremy\Desktop\MINGYANJIA@22239227-javaCA-23Nov2023\MINGYANJIA@22239227-javaCA-23Nov2023\Main.java
File Edit Search View Tools Macros Configure Window Help
Find incrementally Match case

Movie.java MovieArray.java Main.java
Main.java
Main
  Main
  author: MINGYAN JIA
  23 Nov 2023
  // this Main class
  class Main {
  public static void main (
  // create a
  MovieArray
  // call myLoop
  myMA.myLoop
  } // main
  } // Main

Tool Output
Tool completed successfully

C:\WINDOWS\system32\cmd.exe
Enter an string: testShortest
Please enter release year(1900-2024) of the movie
Enter an Int: 1994
Please enter duration (minutes between (60-300)) of the movie
Enter an Int: 144
Please enter rating(0-10) of the movie
Enter an double: 9.4
You have entered 5 movie.
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 3
The Movie with the shortest duration is
the shortest duration: 144 - Movie{title='forrest gump', yearOfRelease=1994, duration=144, rating=9.4}
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int:
```

8. enter another item with same duration as longest item to demonstrate the first item is printed

```
TextPad - C:\Users\Jeremy\Desktop\MINGYANJIA@22239227-javaCA-23Nov2023\MINGYANJIA@22239227-javaCA-23Nov2023>Main.java
File Edit Search View Tools Macros Configure Window Help
Find incrementally Match case

Movie.java MovieArray.java Main.java
Main
  Main
  author: MINGYAN JIA
  23 Nov 2023
  // this Main class
  class Main {
  public static void main() {
  // create a MovieArray
  MovieArray myMA = new MovieArray();
  // call myMA.myLoop
  myMA.myLoop();
  } // main
  } // Main

Tool Output
Tool completed successfully

C:\WINDOWS\system32\cmd.exe
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 1
Please enter title of the movie
Enter an string: testlongest
Please enter release year(1900-2024) of the movie
Enter an Int: 1995
Please enter duration (minutes between (60-300)) of the movie
Enter an Int: 178
Please enter rating(0-10) of the movie
Enter an double: 8.9
You have entered 4 movie.
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 1
Please enter title of the movie
Enter an string: testShortest
Please enter release year(1900-2024) of the movie
Enter an Int: 1994
Please enter duration (minutes between (60-300)) of the movie
Enter an Int: 144
Please enter rating(0-10) of the movie
```

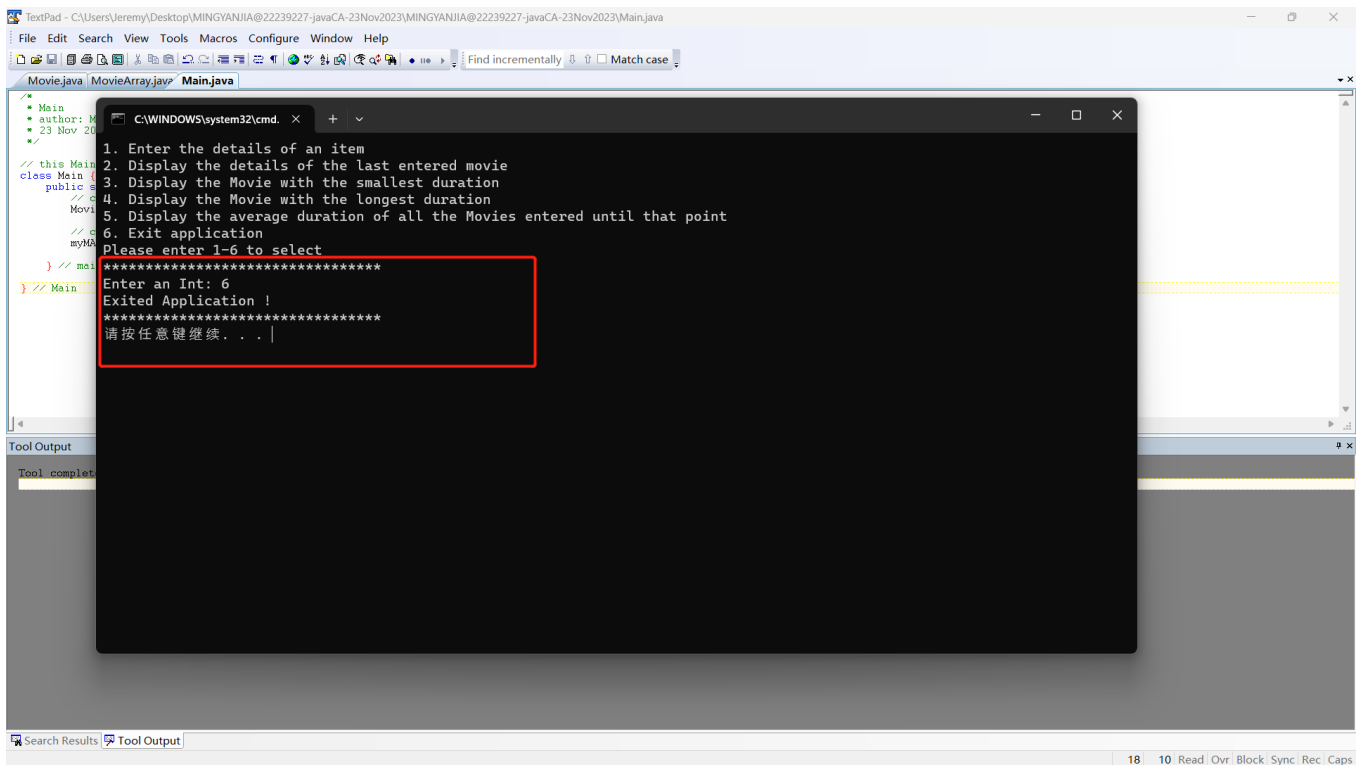
```
TextPad - C:\Users\Jeremy\Desktop\MINGYANJIA@22239227-javaCA-23Nov2023\MINGYANJIA@22239227-javaCA-23Nov2023>Main.java
File Edit Search View Tools Macros Configure Window Help
Find incrementally Match case

Movie.java MovieArray.java Main.java
Main
  Main
  author: MINGYAN JIA
  23 Nov 2023
  // this Main class
  class Main {
  public static void main() {
  // create a MovieArray
  MovieArray myMA = new MovieArray();
  // call myMA.myLoop
  myMA.myLoop();
  } // main
  } // Main

Tool Output
Tool completed successfully

C:\WINDOWS\system32\cmd.exe
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 3
The Movie with the shortest duration is
the shortest duration: 144 - Movie{title='forrest gump', yearOfRelease=1994, duration=144, rating=9.4}
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int: 4
The Movie with the longest duration is
the longest duration: 178 - Movie{title='braveheart', yearOfRelease=1995, duration=178, rating=8.9}
*****
1. Enter the details of an item
2. Display the details of the last entered movie
3. Display the Movie with the smallest duration
4. Display the Movie with the longest duration
5. Display the average duration of all the Movies entered until that point
6. Exit application
Please enter 1-6 to select
*****
Enter an Int:
```

e.3 exit the running



f. source codes

1. Movie.java

```
/*  
 * Movie  
 * author: MINGYAN JIA  
 * 23 Nov 2023  
 */  
import java.util.Scanner;  
import java.util.InputMismatchException;  
  
// Movie class is used as container for instance of movie, provide loads of functio  
// getter and setter of all fields, toString (overflow).  
class Movie {  
    // declaration  
    protected String title;  
    protected int duration;  
    protected Double rating;  
    protected int yearOfRelease;  
  
    // create an instance of Scanner  
    Scanner scanner = new Scanner(System.in);
```

```

// constructor
public Movie() {}

// getDuration
public int getDuration() {
    return duration;
}

// setDuration
public void setDuration() {
    int duration ;
    while(true){
        System.out.println("Please enter duration (minutes between (60-300)) of
duration = intInput();
        if(duration>=60 && duration<=300){
            this.duration = duration;
            break;
        }// if
    }
}

// getRating
public Double getRating() {
    return rating;
}

// setRating
public void setRating() {
    Double rate ;
    while(true){
        System.out.println("Please enter rating(0-10) of the movie ");
        rate = doubleInput();
        if(rate>=0 && rate<=10){
            this.rating = rate;
            break;
        }// if

    }// while

}

// setRating

// getTitle
public String getTitle() {
    return title;
}

```

```

// setTitle
public void setTitle() {
    System.out.println("Please enter title of the movie");
    this.title = stringInput();
}

// getYearOfRelease
public int getYearOfRelease() {
    return yearOfRelease;
}

// setYearOfRelease
public void setYearOfRelease() {
    int year ;
    while(true){
        System.out.println("Please enter release year(1900-2024) of the movie "
        year = intInput();
        if(year>=1900 && year<=2024){
            this.yearOfRelease = year;
            break;
        }// if

    }// while
}

// toString
@Override
public String toString() {
    return "Movie{" +
        "title='" + title + '\'' +
        ", yearOfRelease=" + yearOfRelease +
        ", duration=" + duration +
        ", rating=" + rating +
        '}';
}

// this function is used to get an int enter
public int intInput() {
    // use exception to make codes stronger
    while (true) {
        try {
            System.out.print("Enter an Int: ");
            return scanner.nextInt(); // return an int
        }
    }
}

```

```

        catch (InputMismatchException e) {
            System.out.println("Invalid input, Please enter an integer !");
            scanner.nextLine(); // Clear the invalid input from the scanner
        }
    } // while
} // intInput

// this function is used to get a Double enter
public Double doubleInput() {
    // use exception to make codes stronger
    while (true) {
        try {
            System.out.print("Enter an double: ");
            return scanner.nextDouble(); // return a double
        }
        catch (InputMismatchException e) {
            System.out.println("Invalid input, Please enter an Double !");
            scanner.nextLine(); // Clear the invalid input from the scanner
        }
    } // while
} // doubleInput

public String stringInput() {
    // use exception to make codes stronger
    while (true) {
        try {
            System.out.print("Enter an string: ");
            return scanner.nextLine(); // return a string
        }
        catch (InputMismatchException e) {
            System.out.println("Invalid input, Please enter an string !");
            scanner.nextLine(); // Clear the invalid input from the scanner
        }
    } // while
} // stringInput

} // Movie

```

2. MovieArray.java

```

/*
 * MovieArray

```



```

* author: MINGYAN JIA
* 23 Nov 2023
*/

/*
* this class is used for store instances of Movie and provide function as below
* printSmallestDurationMovie, printLongestDurationMovie, printAverageDuration
*/
public class MovieArray {

    // declaration
    // new an array that contains instances of Movie.
    Movie[] movieArrayList = new Movie[15];
    // Store how many instances in the array, Initialize the size to 0.
    public int size = 0;

    // loop
    public void myLoop(){

        // try to reuse intInput(), I named a intInput() in Movie(cause we didn't 1
        // create an instance of Movie class.
        Movie reuseInput = new Movie();
        int selection;

        // use case flow control to create different branch
        do {
            // print prompt information
            System.out.println("1. Enter the details of an item \n" +
                "2. Display the details of the last entered movie \n" +
                "3. Display the Movie with the smallest duration \n" +
                "4. Display the Movie with the longest duration \n" +
                "5. Display the average duration of all the Movies entered unti
                "6. Exit application \n" + "Please enter 1-6 to select \n*****

            // use a nested do....while to get a valid int enter between scope of 1
            // reuse the intInput() (link to Movie class)
            do {
                selection = reuseInput.intInput();
            } while (selection <= 0 || selection >= 7);

            // from case 1 to 6, refer to different branch
            switch (selection) {

```

```

// Enter the details of an item
case 1:
    // make an instance of Movie and add 1 to size(refer to count
    movieArrayList[size++] = makeInstance();
    System.out.printf("You have entered %s movie.\n", size);
    System.out.println("*****");
    break;

// The details of the last entered movie
case 2:
    // print last item that entered
    // when the size is 0, print remind to enter item first.
    if (size != 0) {
        Movie item = movieArrayList[size-1];
        System.out.println("Last entered movie is \n"+ item.toString()

    }else{
        System.out.println("Please enter items first !!!!! ");
    }
    System.out.println("*****");
    break;

// The Movie with the smallest duration
case 3:
    // print movie with the shortest duration
    // when the size is 0, print remind to enter item first.
    if (size != 0) {
        System.out.println("The Movie with the shortest duration is
        printSmallestDurationMovie());

    }else{
        System.out.println("Please enter items first !!!!! ");
    }
    System.out.println("*****");
    break;

// The Movie with the longest duration
case 4:
    // print movie with the longest duration
    // when the size is 0, print remind to enter item first.
    if (size != 0) {
        System.out.println("The Movie with the longest duration is
        printLongestDurationMovie());

    }else{
        System.out.println("Please enter items first !!!!! ");
    }

```

```

        }
        System.out.println("*****");
        break;

// Average duration of all the Movies entered until that point.
case 5:
    // print average duration.
    // when the size is 0, print remind to enter item first.
    if (size != 0) {
        System.out.println("Average duration of all the Movies is "
            printAverageDuration());

    }else{
        System.out.println("Please enter items first !!!!! ");
    }
    System.out.println("*****");
    break;

// Exit application
case 6:
    System.out.println("Exited Application ! ");
    System.out.println("*****");
    break;

    } // switch

} // do
while(selection !=6 );

} // myLoop

// create an instance of Movie and pass values
private Movie makeInstance(){
    // create a Movie instance
    Movie movie = new Movie();

    // setTitle
    movie.setTitle();
    // setYearOfRelease
    movie.setYearOfRelease();
    // setDuration
    movie.setDuration();
    // setRating
    movie.setRating();
    return movie;
} // makeInstance

```

```

// printSmallestDurationMovie
public void printSmallestDurationMovie(){
    // calculate the min duration
    int minDuration = movieArrayList[0].getDuration();
    for (int i=0; i<size; i++){
        if(movieArrayList[i].getDuration()<minDuration){
            minDuration = movieArrayList[i].getDuration();
        }
    } // for

    // print min duration and the first Movie instance that has the duration.
    for (int i=0; i<size; i++) {
        // compare each duration with min duration.
        if (movieArrayList[i].getDuration() == minDuration) {
            System.out.println("the shortest duration: " + minDuration + " - "
                break;
        }
    } // for
} // printSmallestDurationMovie

// printLongestDurationMovie
public void printLongestDurationMovie(){
    // calculate the maximum duration
    int maxDuration = movieArrayList[0].getDuration();
    for (int i=0; i<size; i++){
        if(movieArrayList[i].getDuration()>maxDuration){
            maxDuration = movieArrayList[i].getDuration();
        }
    } // for

    // print max duration and the first Movie instance that has the duration.
    for (int i=0; i<size; i++) {
        if (movieArrayList[i].getDuration() == maxDuration) {
            System.out.println("the longest duration: " + maxDuration + " - " +
                break;
        }
    } // for

} // printLongestDurationMovie

// printAverageDuration
private void printAverageDuration(){
    // calculate avg duration
    int totalDuration = 0;
    for (int i=0; i<size; i++) {

```

```
        totalDuration+=movieArrayList[i].getDuration();
    } // for

    System.out.println((double) totalDuration/size); // transfer to double
} // printAverageDuration

} // MovieArray
```

3. Main.java

```
/*
 * Main
 * author: MINGYAN JIA
 * 23 Nov 2023
 */

// this Main class is the program entrance.
class Main {
    public static void main(String[] args) {
        // create an instance of MovieArray
        MovieArray myMA = new MovieArray();

        // call myLoop()
        myMA.myLoop();

    } // main

} // Main
```