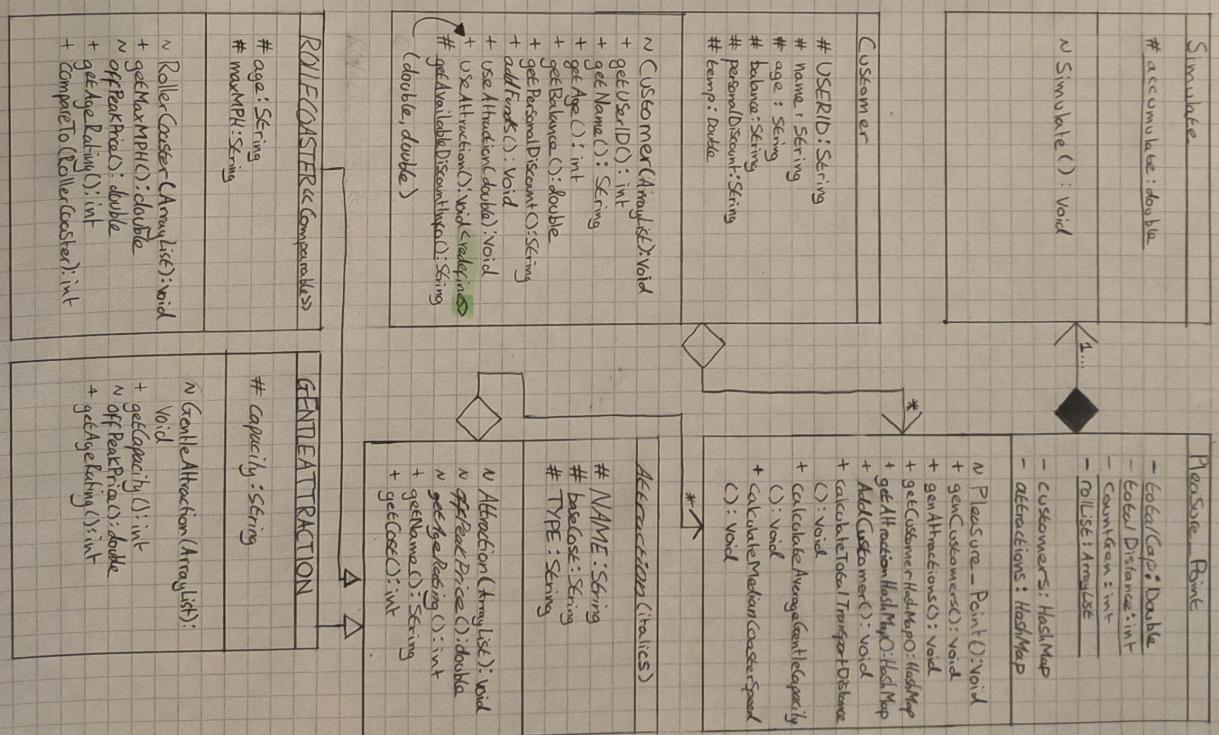


Programming 1 - Coursework Assignment 2

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Wednesday 8th April, 2020 17:14

UML Class Diagram



Listing 1: Attraction.java

```

1 package com.Greedy;
2
3 // Unused imports are required for test harness.
4 import java.util.ArrayList;
5
6 abstract class Attraction {
7
8     // Final as we don't want the name to ever change (HashMap depends on name as
9     // → primary key).
10    protected final String name;
11    protected String baseCost;
12    protected final String type;
13
14    Attraction(ArrayList<String> line) {
15        name = line.get(0);
16        baseCost = line.get(1);
17        type = line.get(2);
18    }
19
20    //Defining abstract methods
21    abstract double offPeakPrice();
22    abstract int getAgeRating();
23
24    // Accessor that retrieves name of any attraction. Not used (yet), but maybe
25    // → useful later on.
26    public String getName() { return name; }
27
28    // parse cost as double here as this is optimal (runtime).
29    public int getCost() { return Integer.parseInt(baseCost); }
30
31    /* TEST HARNESS
32    public static void main(String[] args) throws FileNotFoundException,
33        → InsufficientBalanceException, AgeRestrictionException {
34        String x = "name@250@type";
35        ArrayList<String> y = new ArrayList<>(Arrays.asList(x.split("@")));
36        Attraction test = new Attraction(y) {
37            @Override
38            double offPeakPrice() { return 0; }
39
40            @Override
41            public int getAgeRating() { return 0; }
42        };
43        // TESTS
44        System.out.println(test);
45        System.out.println(test.getCost());
46        System.out.println(test.getName());
47        System.out.println(test.getAgeRating());
48        System.out.println(test.offPeakPrice());
49    }
50 */

```

Listing 2: TransportAttraction.java

```

1 package com.Greedy;
2
3 import java.util.ArrayList;
4
5 // Subclass of baseclass (Attraction) specific too transportation attractions.
6 final class TransportAttraction extends Attraction {
7
8     protected String journey;
9
10    TransportAttraction(ArrayList<String> line) {
11        super(line);
12        journey = line.get(3);
13    }
14
15    @Override
16    double offPeakPrice() { return Double.parseDouble(baseCost) * 0.5; }
17
18    public String toString() {
19        return name + "@" + baseCost + "@" + type + "@" + journey;
20    }
21
22    // Double because client may wish for higher degree of accuracy in future.
23    public double getJourney() { return Double.parseDouble(journey); }
24
25    @Override
26    public int getAgeRating() {
27        return 0;
28    }
29
30    /* TEST HARNESS
31    public static void main(String[] args) {
32        String x = "name@250@type@20.3";
33        ArrayList<String> y = new ArrayList<>(Arrays.asList(x.split("@")));
34        TransportAttraction test = new TransportAttraction(y);
35        System.out.println(test);
36        System.out.println(test.getJourney());
37        System.out.println(test.offPeakPrice());
38        System.out.println(test.getAgeRating());
39    }
40    */
41 }
```

Listing 3: GentleAttraction.java

```

1 package com.Greedy;
2 import java.util.ArrayList;
3
4 // GentleAttraction is another subclass of Attraction, therefore, extends Attraction
5 // → definition as specified
6 final class GentleAttraction extends Attraction {
7
8     protected String capacity;
9
10    GentleAttraction(ArrayList<String> line) {
11        super(line);
12        capacity = line.get(3);
13    }
14
15    // Return capacity of gentle attraction as an integer.
16    public int getCapacity() { return Integer.parseInt(capacity); }
17
18    // Method that returns off peak price of ride.
19    @Override
20    double offPeakPrice() { return Double.parseDouble(baseCost) * 0.2; }
21
22    @Override
23    public String toString() {
24        return name + "@" + baseCost + "@" + type + "@" + capacity;
25    }
26
27    @Override
28    public int getAgeRating() { return 0; }
29
30    /* TEST HARNESS
31    public static void main(String[] args) {
32        String x = "name@250@type@4";
33        ArrayList<String> y = new ArrayList<>(Arrays.asList(x.split("@")));
34        GentleAttraction test = new GentleAttraction(y);
35        System.out.println(test);
36        System.out.println(test.getCapacity());
37        System.out.println(test.getAgeRating());
38        System.out.println(test.offPeakPrice());
39    }
40 */

```

Listing 4: RollerCoaster.java

```

1 package com.Greedy;
2
3 import java.util.ArrayList;
4
5 // RollerCoaster is an extension on what has been defined in Attraction.
6 final class RollerCoaster extends Attraction implements Comparable<RollerCoaster> {
7
8     // Protected fields for roller coaster.
9     protected String age;
10    protected String maxMPH;
11
12    // ArrayList to extend definition of subclass.
13    RollerCoaster(ArrayList<String> line) {
14        super(line);
15        age = line.get(3);
16        maxMPH = line.get(4);
17    }
18
19    // returns double for maximum MPH of roller-coaster.
20    public Double getMaxMPH() {
21        return Double.parseDouble(maxMPH);
22    }
23
24    // offPeakPrice
25    @Override
26    double offPeakPrice() {
27        return Double.parseDouble(baseCost);
28    }
29
30    //returns integer of the rides age-rating (e.g. 12).
31    @Override
32    public int getAgeRating() {
33        return Integer.parseInt(age);
34    }
35
36    @Override
37    public String toString() {
38        return name + "@" + baseCost + "@" + type + "@" + age + "@" + maxMPH;
39    }
40
41    // Compares previous and current maxMPH to sort into list later (refer to
42    // ↵ Pleasure_Point class).
43    @Override
44    public int compareTo(RollerCoaster rollerCoaster) {
45        return Double.compare(rollerCoaster.getMaxMPH(), this.getMaxMPH());
46    }
47
48    /* TEST HARNESS
49    public static void main(String[] args) {
50        String x = "name@250@type@20@55.2";
51        ArrayList<String> y = new ArrayList<>(Arrays.asList(x.split("@")));
52        RollerCoaster test = new RollerCoaster(y);
53        System.out.println(test);
54        System.out.println(test.getMaxMPH());
55        System.out.println(test.offPeakPrice());
56        System.out.println(test.getAgeRating());
57    }
58 */

```

Listing 5: Customer.java

```

1 package com.Greedy;
2
3 import java.util.ArrayList;
4
5 public class Customer {
6
7     protected final String userID;
8     protected String name;
9     protected String age;
10    protected String balance;
11    protected String personalDiscount;
12    protected Double temp;
13
14
15    // Defines 'Customer' object. Used ArrayList as size of Customer does change.
16    Customer(ArrayList<String> line) {
17        userID = line.get(0);
18        name = line.get(1);
19        age = line.get(2);
20        balance = line.get(3);
21        if (line.size() > 4)
22            personalDiscount = line.get(4);
23        else
24            personalDiscount = null;
25    }
26
27    // Accessors
28    public int getUserID() { return Integer.parseInt(userID); }
29    public String getName() { return name; }
30    public int getAge() { return Integer.parseInt(age); }
31    public double getBalance() { return Double.parseDouble(balance); }
32    public String getPersonalDiscount() { return personalDiscount; }
33
34    // Method that adds 'amount' to the customers balance.
35    public void addFunds(String amount) {
36        double temp = getBalance() + Integer.parseInt(amount);
37        balance = String.valueOf(temp);
38    }
39
40    // Method that reduced balance when using attraction (if customer has enough).
41    public void useAttraction(double attractionPrice) throws
42        InsufficientBalanceException {
43
44        double price;
45
46        if (personalDiscount == null) {
47            if (getBalance() - attractionPrice < 0) {
48                throw new InsufficientBalanceException
49                    ("Not enough funds (" + -(getBalance() - attractionPrice) +
50                     "p) difference");
51            }
52            balance = Double.toString(getBalance() - attractionPrice);
53            System.out.println(attractionPrice);
54            Simulate.accumulate += attractionPrice;
55
56        } else {
57            switch (personalDiscount) {
58                case "FAMILY":
```

```

58         price = attractionPrice * 0.85;
59         temp = getBalance() - price;
60         if (temp < 0) {
61             throw new InsufficientBalanceException("Not enough funds (" +
62             ↪ -temp + "p) difference");
63         }
64         else {
65             Simulate.accumulate += price;
66             System.out.println(price);
67             balance = temp.toString();
68         }
69         break;
70
71     case "STUDENT":
72         price = attractionPrice * 0.9;
73         temp = getBalance() - price;
74         if (temp < 0) {
75             throw new InsufficientBalanceException("Not enough funds (" +
76             ↪ -temp + "p) difference");
77         }
78         else {
79             Simulate.accumulate += price;
80             System.out.println(price);
81             balance = temp.toString();
82         }
83         break;
84
85     default:
86         //balance = Double.toString(getBalance() - attractionPrice);
87         System.out.println("error");
88         break;
89     }
90 }
91
92 public void useAttraction(double limit, double attractionPrice) throws
93     AgeRestrictionException, InsufficientBalanceException {
94     if (getAge() < limit) {
95         throw new AgeRestrictionException("Sorry, you are not old enough to use
96             ↪ this attraction.");
97     }
98     else
99         useAttraction(attractionPrice);
100 }
101
102 // Displays Discount information
103 protected static String getAvailableDiscountInfo() {
104     String infoTit = String.format(
105         "%-25s %-25s %-25s", "Family Discount",
106         "Student Discount", "Park Employees");
107     String info = String.format(
108         ("%-25s %-25s %-25s", "15% deduction",
109         "10% deduction", "15% deduction"));
110     return "\n" + infoTit + "\n" + info;
111 }
112
113 @Override
114 public String toString() {
115     String outPut = userID + "#" + name + "#" + age + "#" + balance;
116     if (personalDiscount == null || personalDiscount.equals("")) return outPut;

```

```

115         else outPut = outPut + "#" + personalDiscount;
116     return outPut;
117 }
118
119 @Override
120 public int hashCode() {
121     return Integer.parseInt(userID);
122 }
123
124 /* TEST HARNESS
125 public static void main(String[] args) throws InsufficientBalanceException {
126
127     // TEST 1 - Customer object with 5 fields:
128     String record = "123456,name,23,54.2,STUDENT";
129     ArrayList<String> objectBase = new
130         ↪ ArrayList<>(Arrays.asList(record.split(",")));
131     Customer test = new Customer(objectBase);
132     System.out.println(test);
133
134     // TEST 2 - Customer object with 4 fields:
135     String record2 = "654321,name,23,23.1";
136     ArrayList<String> objectBase2 = new
137         ↪ ArrayList<>(Arrays.asList(record2.split(",")));
138     Customer test2 = new Customer(objectBase2);
139     System.out.println(test2);
140
141     System.out.println(getAvailableDiscountInfo());
142
143     // WORKS
144     test2.useAttraction(4444);
145     test.useAttraction(4444);
146 }
145 */
146 }
```

Listing 6: PleasurePoint.java

```

1
2 package com.Greedy;
3
4 import java.io.File;
5 import java.io.FileNotFoundException;
6 import java.util.*;
7
8
9
10 class Pleasure_Point {
11
12     // Static data types/structure for referencing in multiple methods.
13     private static double totalCap;
14     private static int totalDistance;
15     private static int countGen = 0;
16     private static ArrayList<RollerCoaster> rollList = new ArrayList<>();
17
18     // HashMaps to store multiple customer and attraction objects (separately).
19     private static HashMap<Integer, Customer> customers = new HashMap<>();
20     private static HashMap<String, Attraction> attractions = new HashMap<>();
21
22     // Constructor automatically creates customers and attractions when
23     // → Pleasure_Point class is created.
24     public Pleasure_Point() throws FileNotFoundException {
25         genAttractions();
26         genCustomers();
27     }
28
29     // Generates customer objects and adds them to the 'customers' HashMap.
30     public void genCustomers() throws FileNotFoundException {
31
32         Scanner scannerC = new Scanner(new File("customers.txt"));
33
34         /*
35          Loop that scans each line in file, stores as string type,
36          then splits string based off regex '#'
37          into a String[] type (called "fields").
38          With this data, we can create a 'new' instance of
39          class Customer (called "cus").
40          when then add this to CustomerList class (called "customers").
41          Repeats till encounters empty line.
42         */
43
44         while (scannerC.hasNextLine()) {
45             String record = scannerC.nextLine();
46             ArrayList<String> objectCus = new
47                 → ArrayList<>(Arrays.asList(record.split("#")));
48             Customer cus = new Customer(objectCus);
49             customers.put(cus.getUserID(), cus);
50         }
51         for (Integer key : customers.keySet()) {
52             System.out.println(customers.get(key));
53         }
54         System.out.println("\n");
55     }
56
57     // Generates attraction objects and adds them to the 'Attractions' HashMap.
58     public void genAttractions() throws FileNotFoundException {
59         Scanner scannerA = new Scanner(new File("attractions.txt"));

```

```

58
59     while(scannerA.hasNextLine()) {
60
61         String record = scannerA.nextLine();
62         ArrayList<String> objectBase = new
63             ↪ ArrayList<>(Arrays.asList(record.split("@")));
64         Attraction a = new Attraction(objectBase) {
65             @Override
66             double offPeakPrice() { return 0; }
67
68             @Override
69             public int getAgeRating() { return 0; }
70         };
71
72         // Switch checks what type of attraction it is, then builds object
73         ↪ accordingly.
74         switch(a.type) {
75             case "TRA":
76                 ArrayList<String> objectT = new
77                     ↪ ArrayList<>(Arrays.asList(record.split("@")));
78                 TransportAttraction tran = new TransportAttraction(objectT);
79                 totalDistance += tran.getJourney();
80                 attractions.put(tran.name.trim(), tran);
81                 break;
82             case "GEN":
83                 ArrayList<String> objectG = new
84                     ↪ ArrayList<>(Arrays.asList(record.split("@")));
85                 GentleAttraction gen = new GentleAttraction(objectG);
86                 totalCap += gen.getCapacity();
87                 countGen++;
88                 attractions.put(gen.name.trim(), gen);
89                 break;
90             case "ROL":
91                 ArrayList<String> objectR = new
92                     ↪ ArrayList<>(Arrays.asList(record.split("@")));
93                 RollerCoaster rol = new RollerCoaster(objectR);
94                 attractions.put(rol.name.trim(), rol);
95                 rollList.add(rol);
96                 break;
97             default:
98                 System.out.println("Invalid attraction detected!");
99                 break;
100            }
101        }
102
103        // Accessors for HashMap(s).
104        public HashMap<Integer, Customer> getCustomerHashMap() {
105            return customers;
106        }
107        public HashMap<String, Attraction> getAttractionHashMap() { return attractions; }
108
109        // Method adds new customer (assuming request in transactions format).
110        public void addCustomer(String[] line) {
111            ArrayList<String> cus = new ArrayList<>(Arrays.asList(line));
112            if (cus.contains("ADD_CUSTOMER")) cus.remove(0);
113            Customer newCustomer = new Customer(cus);
114            customers.put(newCustomer.getUserID(), newCustomer);
115        }
116    }
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```

113 // Shows result of adding all distances from transport attractions.
114 public void calculateTotalTransportDistance() {
115     System.out.println("The total transport distance of all transport
116     → attractions: " + totalDistance);
117 }
118
119 // Shows average amount of seats in a gentle attraction.
120 public void calculateAverageGentleCapacity() {
121     System.out.println("Average gentle attraction capacity (approx): " +
122     → Math.round(totalCap/countGen));
123 }
124
125 public void calculateMedianCoasterSpeed() {
126     // finds median if number of roller coasters is odd.
127     rolList.sort(RollerCoaster::compareTo);
128     if(rolList.size()%2 != 0) {
129         System.out.println("The median roller coaster speed: " +
130         → rolList.get(rolList.size() / 2).maxMPH);
131     }
132     // finds median if number of roller coasters is even.
133     else {
134         double temp =
135         → Math.round(Double.parseDouble(String.valueOf(rolList.size()/2)));
136         double median = ((temp - 1) + (temp + 2)) / 2;
137         System.out.println(median);
138     }
139 }
140
141 /* TEST HARNESS
142 public static void main(String[] args) throws FileNotFoundException {
143
144     genCustomers();
145     genAttractions();
146     System.out.println(customers.get(585526));
147     System.out.println(attractions.get("Tower of Midnight").getCost());
148     String[] line = {"999888", "dave", "45", "65.22", null };
149     //AddCustomer(line);
150     customers.remove(999888);
151     System.out.println(customers.get(999888));
152
153     // RETURN TO STATIC TO USE
154     //System.out.println(getCustomerHashMap().get(585526));
155     //System.out.println(getAttractionHashMap().get("Tower of Midnight"));
156
157     // MAKE STATIC TO WORK IN THIS MAIN!
158     //calculateTotalTransportDistance();
159     //calculateAverageGentleCapacity();
160     //calculateMedianCoasterSpeed();
161 }
162 */

```

Listing 7: Simulate.java

```

1
2 package com.Greedy;
3
4 import java.io.File;
5 import java.io.FileNotFoundException;
6 import java.util.Arrays;
7 import java.util.Scanner;
8
9 /**
10  * BY: CALLUM CLEGG [100279967]
11
12 Data-Structures:
13 I decided to make my customer and attraction constructors store data in an ArrayList.
14 I felt this was justified as the number of fields varied depending on the type of
15 customer or attraction subclass.
16
17 Furthermore, I used hash-maps to store my all customers and all attractions because
18   ↪ it is
19 capable of faster element access, I can also use hash keys which fits well with
20   ↪ unique
21 fields provided (i.e. 'userID' is always unique in-addition to attraction names
22   ↪ [viable primary key]).
23
24 Testing:
25 I have included the txt files I used to test different types of
26   ↪ customers/attractions.
27 The customers and attractions I used were pre-existing, meaning I could use the
28   ↪ original
29 'transactions.txt' in order to test if my classes were performing as expected.
30
31 All classes (except those that extend 'exception' or Simulate), have a 'TEST
32   ↪ HARNESS' located
33 at the bottom of each class. Redundant imports are present due to their need when
34   ↪ 'TEST HARNESS'
35 is un-commented.
36
37 LAST UPDATED: 08/04/2020
38 */
39
40 class Simulate {
41
42     // Single double variable that 'accumulates' profit from useAttraction method.
43     static double accumulate;
44
45     public static void main(String[] args) throws FileNotFoundException {
46         Simulate assignment = new Simulate();
47         System.out.println(assignment);
48     }
49
50     Simulate() throws FileNotFoundException {
51
52         Pleasure_Point pleasurePoint = new Pleasure_Point(); // Create instance of
53             ↪ Pleasure_Point object.
54         Scanner transactions = new Scanner(new File("transactions.txt"));
55
56         while (transactions.hasNextLine()) {
57
58             //Break down each line of the transactions file into a number of fields.
59             String record = transactions.nextLine();

```

```
52     String[] fields = record.split(",");  
53  
54     // Switch checks what type of transaction the line is, acts accordingly  
55     // (based off index 0).  
56     switch (fields[0]) {  
57  
58         case "USE_ATTRACTION":  
59  
60             String name = fields[3].trim();  
61  
62             double price =  
63                 ↪ pleasurePoint.getAttractionHashMap().get(name).getCost();  
64             double priceOffPeak =  
65                 ↪ pleasurePoint.getAttractionHashMap().get(name).offPeakPrice();  
66  
67             // Required age for ride (only relevant to roller coasters).  
68             int age =  
69                 ↪ pleasurePoint.getAttractionHashMap().get(fields[3]).getAgeRating();  
70  
71             // Try catch to see if user has enough in balance to pay for ride  
72             // referenced in index 3.  
73             try {  
74                 if  
75                     ↪ (pleasurePoint.getAttractionHashMap().get(fields[3]).type.equals("STANDARD_PRICE")) {  
76                     System.out.println(pleasurePoint.getCustomerHashMap()  
77                         .get(Integer.parseInt(fields[2])));  
78                     pleasurePoint.getCustomerHashMap()  
79                         .get(Integer.parseInt(fields[2])).useAttraction(age,  
80                                         ↪ price);  
81                     System.out.println(pleasurePoint.getCustomerHashMap()  
82                         .get(Integer.parseInt(fields[2])) + "\n");  
83                 } else if (fields[1].equals("OFF_PEAK")) {  
84                     System.out.println(pleasurePoint.getCustomerHashMap()  
85                         .get(Integer.parseInt(fields[2])));  
86  
87                     pleasurePoint.getCustomerHashMap()  
88                         .get(Integer.parseInt(fields[2])).useAttraction(age,  
89                                         ↪ priceOffPeak);  
90                     System.out.println(pleasurePoint.getCustomerHashMap()  
91                         .get(Integer.parseInt(fields[2])) + "\n");  
92                 } else {  
93                     System.out.println("ERROR: OFF_PEAK or STANDARD_PRICE  
94                         ↪ not found!");  
95                     System.out.println(pleasurePoint.getCustomerHashMap()  
96                         .get(Integer.parseInt(fields[2])));  
97                     break;  
98                 }  
99             }  
100            }  
101        } catch (InsufficientBalanceException | AgeRestrictionException  
102            ↪ e) {  
103            System.out.println(e.toString() + " -> " + fields[2] + "\n");  
104        }  
105  
106        try {  
107            if  
108                ↪ (!pleasurePoint.getAttractionHashMap().get(fields[3]).type.equals("STANDARD_PRICE")) {  
109                    System.out.println("OFF PEAK PRICE");  
110                }  
111            }  
112        }  
113    }  
114}
```

```

99
100         if (fields[1].equals("STANDARD_PRICE")) {
101             System.out.println(pleasurePoint.getCustomerHashMap().
102                 get(Integer.parseInt(fields[2])));
103             pleasurePoint.getCustomerHashMap().get(Integer.parseInt(field
104                 useAttraction(Double.parseDouble(String.valueOf(price
105                 System.out.println(pleasurePoint.getCustomerHashMap().
106                     get(Integer.parseInt(fields[2])) + "\n");
107             } else if (fields[1].equals("OFF_PEAK")) {
108                 System.out.println(pleasurePoint.getCustomerHashMap().
109                     get(Integer.parseInt(fields[2])));
110                 pleasurePoint.getCustomerHashMap().get(Integer.parseInt(fields[2])).useAttraction(price
111                 System.out.println(pleasurePoint.getCustomerHashMap().
112                     get(Integer.parseInt(fields[2])) + "\n");
113             } else {
114                 System.out.println("ERROR: OFF_PEAK or STANDARD_PRICE
115                     ↪ not found!");
116                 System.out.println(pleasurePoint.getCustomerHashMap().
117                     get(Integer.parseInt(fields[2])) + "\n");
118                 break;
119             }
120         }
121     } catch (InsufficientBalanceException e) {
122         System.out.println(e.toString() + " -> " + fields[2] + "\n");
123     }
124
125     break;
126
127 case "NEW_CUSTOMER":
128     fields = Arrays.copyOfRange(fields, 1, fields.length);
129     pleasurePoint.addCustomer(fields);
130     System.out.println("NEW CUSTOMER: " +
131         ↪ pleasurePoint.getCustomerHashMap().
132             get(Integer.parseInt(fields[0])) + "\n");
133     break;
134 case "ADD_FUNDS":
135     System.out.println("Before: " +
136         ↪ pleasurePoint.getCustomerHashMap().
137             get(Integer.parseInt(fields[1])));
138
139     System.out.println(fields[2] + "+");
140
141     pleasurePoint.getCustomerHashMap().get(Integer.parseInt(fields[1])).addF
142
143     System.out.println("After: " + pleasurePoint.getCustomerHashMap().
144         get(Integer.parseInt(fields[1])) + "\n");
145     break;
146
147     default:
148         System.out.println("ERROR");
149     }
150
151     System.out.println("\n");
152     pleasurePoint.calculateAverageGentleCapacity();
153     pleasurePoint.calculateMedianCoasterSpeed();
154     pleasurePoint.calculateTotalTransportDistance();
155     System.out.println(Customer.getAvailableDiscountInfo());

```

```
156     System.out.println("Total profit: " + accumulate);
157 }
158 @Override
159 public String toString() { return ""; }
160 }
```

Listing 8: InsufficientBalanceException.java

```
1 package com.Greedy;
2
3 // Custom exception for insufficient balance
4 class InsufficientBalanceException extends Exception {
5     InsufficientBalanceException(String message) {
6         super(message);
7     }
8 }
```

Listing 9: AgeRestrictionException.java

```
1 package com.Greedy;
2
3 // Custom exception for age restriction.
4 public class AgeRestrictionException extends Exception {
5     AgeRestrictionException(String message) {
6         super(message);
7     }
8 }
```