Міністерство освіти і науки України

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**ЗВІТ**

до лабораторної роботи № 6

з предмету:

„Основи технологій програмування”

|  |  |  |  |  |
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ЗМІСТ

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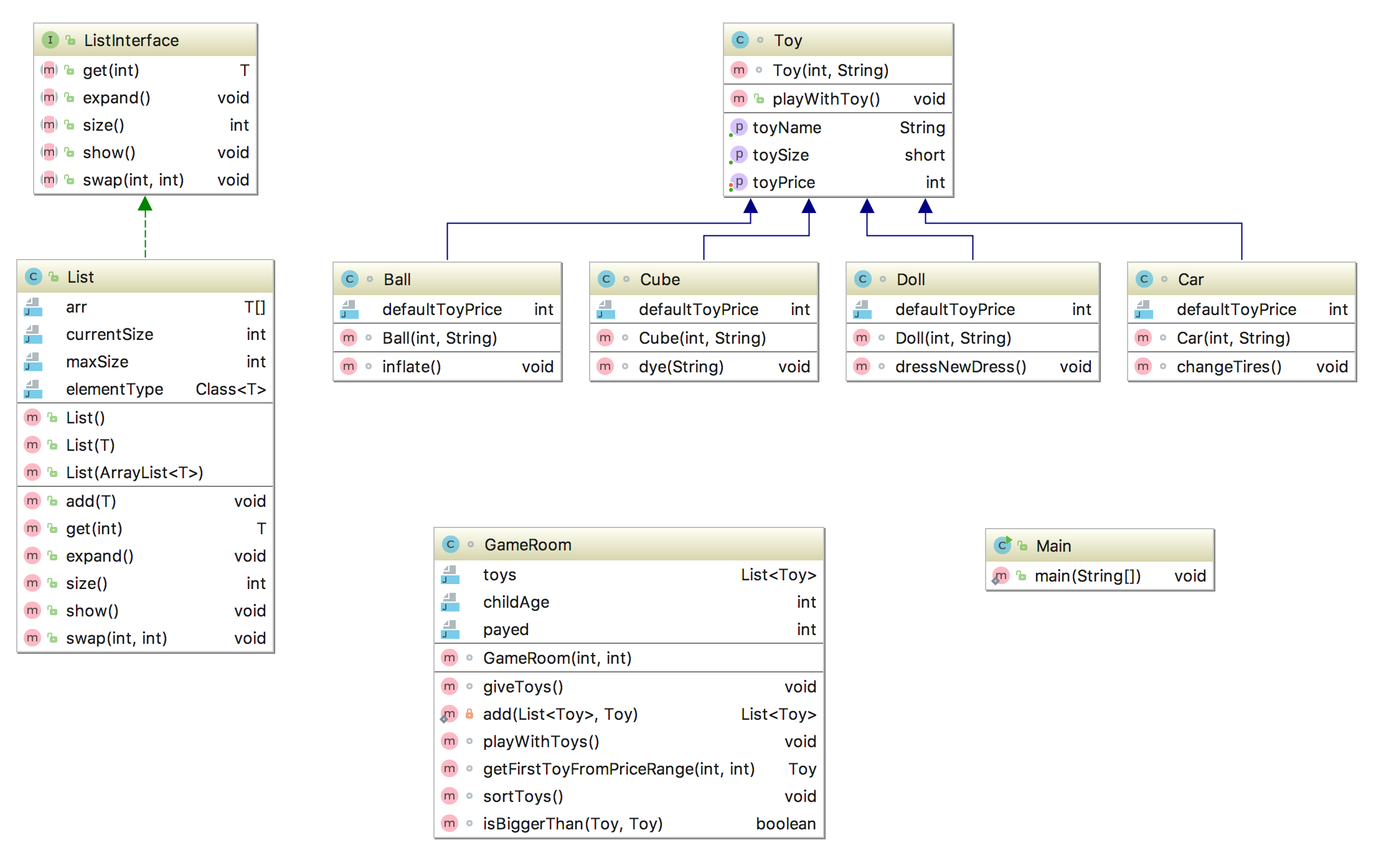
# постановка задачі

Створити клас, що описує типізовану колекцію (типом колекції є узагальнений клас з лабораторної роботи No5), що реалізує заданий варіантом інтерфейс (п.2) та має задану внутрішню структуру (п.3). Реалізувати всі методи інтерфейсу, а також створити не менше ніж 3 конструктори (1 – порожній, 2 – в який передається 1 об’єкт узагальненого класу, 3 – в який передається стандартна колекція об’єктів, наприклад, ArrayList). Всі початкові дані задаються у виконавчому методі. Код повинен відповідати стандартам JCC та бути детально задокументований.

Інтерфейс – List

Внутрішня структура колекції – масив із початковою кількістю елементів 15 та збільшенням кількості елементів на 30%

# Діаграма класів



# Висновок

Складнощів з реалізацією спискової структури з використанням масиву у лабораторній роботі не виникло, всі стандартні зв’язні структури даних були замінені власним списком без виявлення помилок.

# Код програми

*/\*\*  
 \* Java labs – Lab6  
 \** ***@version*** *1.0 2018-04-03  
 \** ***@author*** *Misha Kushka  
 \*/*

**import** java.lang.reflect.Array;  
**import** java.util.ArrayList; */\*\*  
 \* Implementation of the real-world toy with it's  
 \* properties such as size, type, color and such things  
 \* to do with it as playing with toy.  
 \*/***class** Toy {  
  
 **private short toySize**; *// size of the toy* **private int toyPrice**; *// price of the toy* **public final** String **toyName**; *// name of the toy  
  
 /\*\*  
 \* Toy's constructor, which sets toy's name  
 \* depending on the child age.  
 \*  
 \** ***@param childAge*** *Age of the child.  
 \** ***@param newToyName*** *Part of the toy name without  
 \* appendix of it's size.  
 \*/* Toy(**int** childAge, String newToyName) {  
 **if** (childAge <= 5) {  
 **toySize** = 1;  
 newToyName = **"small "** + newToyName;  
 } **else if** (childAge > 5 && childAge <= 10) {  
 **toySize** = 2;  
 newToyName = **"medium "** + newToyName;  
 } **else** {  
 **toySize** = 3;  
 newToyName = **"big "** + newToyName;  
 }  
  
 **toyName** = newToyName;  
 }  
  
 */\*\*  
 \* Immitates process of playing with toy.  
 \*/* **public void** playWithToy() {  
 System.***out***.println(**"Now child is playing with the "** + **toyName** + **"."**);  
 }  
  
 */\*\*  
 \* Setter for the toy price.  
 \** ***@param newPrice*** *New price of the toy to set.  
 \*/* **public void** setToyPrice(**int** newPrice) {  
 **toyPrice** = newPrice;  
 }  
  
 */\*\*  
 \* Getter for the toy size.  
 \** ***@return*** *Size of the toy.  
 \*/* **public short** getToySize() {  
 **return toySize**;  
 }  
  
 */\*\*  
 \* Getter for the toy prise.  
 \** ***@return*** *Price of the toy.  
 \*/* **public int** getToyPrice() {  
 **return toyPrice**;  
 }  
  
 */\*\*  
 \* Getter for the toy name.  
 \** ***@return*** *Toy's name.  
 \*/* **public** String getToyName() {  
 **return toyName**;  
 }  
  
}

*/\*\*  
 \* Ball toy for girls & boys of different ages.  
 \*/***class** Ball **extends** Toy {  
  
 **private int defaultToyPrice** = 1; *// price of the toy, not considering child age  
  
 /\*\*  
 \* Call's the constructor of the parent's Toy class,  
 \* sets toy's price, which isn't depends on the age  
 \* of the child.  
 \*  
 \** ***@param childAge*** *Age of the child.  
 \** ***@param newToyName*** *Name of the toy.  
 \*/* Ball(**int** childAge, String newToyName) {  
 **super**(childAge, newToyName);  
 setToyPrice(**defaultToyPrice**);  
 }  
  
 */\*\*  
 \* Some another method for this class.  
 \*/* **void** inflate() {  
 System.***out***.println(**"Inflate the ball."**);  
 }  
  
}

*/\*\*  
 \* Car toy for boys of different ages.  
 \*/***class** Car **extends** Toy {  
  
 **private int defaultToyPrice** = 3; *// price of the toy, not considering child age  
  
 /\*\*  
 \* Call's the constructor of the parent's Toy class,  
 \* sets toy's price depends of the default toy price  
 \* and age of the child.  
 \*  
 \** ***@param childAge*** *Age of the child.  
 \** ***@param newToyName*** *Name of the toy.  
 \*/* Car(**int** childAge, String newToyName) {  
 **super**(childAge, newToyName);  
 setToyPrice(**defaultToyPrice** \* getToySize());  
 }  
  
 */\*\*  
 \* Some another method for this class.  
 \*/* **void** changeTires() {  
 System.***out***.println(**"Now your car is equiped with the new tires."**);  
 }  
  
}

*/\*\*  
 \* Cube toy for girls & boys of different ages.  
 \*/***class** Cube **extends** Toy {  
  
 **private int defaultToyPrice** = 4; *// price of the toy, not considering child age  
  
 /\*\*  
 \* Call's the constructor of the parent's Toy class,  
 \* sets toy's price depends of the default toy price  
 \* and age of the child.  
 \*  
 \** ***@param childAge*** *Age of the child.  
 \** ***@param newToyName*** *Name of the toy.  
 \*/* Cube(**int** childAge, String newToyName) {  
 **super**(childAge, newToyName);  
 setToyPrice(**defaultToyPrice** \* getToySize());  
 }  
  
 */\*\*  
 \* Some another method for this class.  
 \*/* **void** dye(String color) {  
 System.***out***.println(**"Now color of the your cube is "** + color + **"."**);  
 }  
  
}

*/\*\*  
 \* Doll toy for girls of different ages.  
 \*/***class** Doll **extends** Toy {  
  
 **private int defaultToyPrice** = 5; *// price of the toy, not considering child age  
  
 /\*\*  
 \* Call's the constructor of the parent's Toy class,  
 \* sets toy's price depends of the default toy price  
 \* and age of the child.  
 \*  
 \** ***@param childAge*** *Age of the child.  
 \** ***@param newToyName*** *Name of the toy.  
 \*/* Doll(**int** childAge, String newToyName) {  
 **super**(childAge, newToyName);  
 setToyPrice(**defaultToyPrice** \* getToySize());  
 }  
  
 */\*\*  
 \* Some another method for this class.  
 \*/* **void** dressNewDress() {  
 System.***out***.println(**"Now your doll wears in the new dress."**);  
 }  
  
}

*/\*\*  
 \* Implementation of the gaming room for children  
 \* of different ages.  
 \*/***class** GameRoom {  
  
 **private** List<Toy> **toys** = **new** List<>(); *// array of toys in the game room* **private int childAge**; *// age of the child* **private int payed**; *// how much was payed for the room  
  
 /\*\*  
 \* Allow to pay for playing in the game room.  
 \* Depending on the amount of money child can  
 \* play with different number of toys.  
 \*  
 \** ***@param amount*** *Amount of money to pay for playing.  
 \** ***@param age*** *Age of the child in the room.  
 \*/* GameRoom(**int** amount, **int** age) {  
 *// Too low payment checker.* **if** (amount < 1) {  
 System.***err***.println(**"Sorry, but the cheapest toy costs $1."**);  
 System.*exit*(1);  
 }  
 **childAge** = age;  
 **payed** = amount;  
  
 *// Fill toys array with toys.* giveToys();  
  
 *// Show how many toys are available depends of the payed amount.* **try** {  
 System.***out***.println(**"Now you can play with "** + **toys**.size() + **" toys."**);  
 } **catch** (NullPointerException e) {  
 System.***err***.println(**"Add elements to the toys array first."**);  
 System.*exit*(2);  
 }  
 }  
  
 */\*\*  
 \* Fill the toys array with different toys object's  
 \* depends of the payed amount for the room.  
 \*/* **void** giveToys() {  
  
 *// Toys, which are in the room.* List<Toy> defaultToys = **new** List<>();  
  
 defaultToys.add(**new** Car(**childAge**, **"super car"**));  
 defaultToys.add(**new** Doll(**childAge**, **"cool doll"**));  
 defaultToys.add(**new** Ball(**childAge**, **"amazing ball"**));  
 defaultToys.add(**new** Cube(**childAge**, **"crazy cube"**));  
  
 **int**[] defaultToyPrices = **new int**[defaultToys.size()]; *// prices of toys in the room  
  
 // Set prices for all toys in the room depending on the child age.* **for** (**int** i = 0; i < defaultToyPrices.**length**; i++) {  
 defaultToyPrices[i] = defaultToys.get(i).getToyPrice();  
 }  
  
 **int** totalPrice = 0; *// total price of all toys for the current child* **int** iteration = 0; *// number of iterations of adding toys  
  
 // A little bit randomly choose toys for the particular child  
 // depending on the child age and payed amount.* **while** (totalPrice < **payed**) {  
 **switch** (iteration%4) {  
 **case** 0:  
 **if** (totalPrice + defaultToyPrices[0] <= **payed**) {  
 **toys** = *add*(**toys**, defaultToys.get(0));  
 totalPrice += defaultToyPrices[0];  
 }  
 **break**;  
 **case** 1:  
 **if** (totalPrice + defaultToyPrices[1] <= **payed**) {  
 **toys** = *add*(**toys**, defaultToys.get(1));  
 totalPrice += defaultToyPrices[1];  
 }  
 **break**;  
 **case** 2:  
 **if** (totalPrice + defaultToyPrices[2] <= **payed**) {  
 **toys** = *add*(**toys**, defaultToys.get(2));  
 totalPrice += defaultToyPrices[2];  
 }  
 **break**;  
 **default**:  
 **if** (totalPrice + defaultToyPrices[3] <= **payed**) {  
 **toys** = *add*(**toys**, defaultToys.get(3));  
 totalPrice += defaultToyPrices[3];  
 }  
 **break**;  
 }  
 iteration++;  
 }  
  
 System.***out***.println(**"Total price: $"** + totalPrice);  
  
 }  
  
 */\*\*  
 \* Add element to the Toy's array.  
 \*  
 \** ***@param originalArray*** *Array to put element into.  
 \** ***@param newItem*** *Element to put.  
 \** ***@return*** *New array with added element.  
 \*/* **private static** List<Toy> add(List<Toy> originalArray, Toy newItem) {  
 **int** currentSize = originalArray.size();  
 **int** newSize = currentSize + 1;  
 List<Toy> tempArray = **new** List<>();  
 **for** (**int** i = 0; i < currentSize; i++) {  
 tempArray.add(originalArray.get(i));  
 }  
 tempArray.add(newItem);  
 **return** tempArray;  
 }  
  
 */\*\*  
 \* Execute method of playing with all toys  
 \* of the particular child.  
 \*/* **void** playWithToys() {  
 **for** (**int** i = 0; i < **toys**.size(); i++) {  
 **toys**.get(i).playWithToy();  
 }  
 }  
  
 */\*\*  
 \* Get first toy from the setted range by toy's price.  
 \*  
 \** ***@param min*** *Minimum price of the toy to find.  
 \** ***@param max*** *Maximum price of the toy to find.  
 \** ***@return*** *First toy with price from range if found,  
 \* or null otherwise.  
 \*/* Toy getFirstToyFromPriceRange(**int** min, **int** max) {  
  
 *// Check is min < max.* **if** (min > max) {  
 System.***out***.println(**"Attention! min value is bigger, than max value!"**);  
 }  
  
 *// Iteratively find toy from the given range.* **for** (**int** i = 0; i < **toys**.size(); i++) {  
 **if** (**toys**.get(i).getToyPrice() >= min && **toys**.get(i).getToyPrice() <= max) {  
 **return toys**.get(i);  
 }  
 }  
  
 **return null**;  
 }  
  
 */\*\*  
 \* Sort toys by the name of their classes alphabetically.  
 \*/* **void** sortToys() {  
 **int** i, j; *// iterators* **int** n = **toys**.size(); *// length of the toys array* Toy temp; *// temporary Toy object to swap elements  
  
 // Bubble sort for the array of toys.* **for** (i = 0; i < n-1; i++) {  
 **for** (j = 0; j < n - i - 1; j++) {  
 **if** (isBiggerThan(**toys**.get(j), **toys**.get(j+1))) {  
 **toys**.swap(j, j+1);  
 }  
 }  
 }  
 }  
  
 **boolean** isBiggerThan(Toy first, Toy second) {  
 **int** firstIndex, secondIndex;  
  
 *// Align class names with indexes.  
 // First object.* **switch** (first.getClass().getName()) {  
 **case** (**"Ball"**):  
 firstIndex = 0;  
 **break**;  
 **case** (**"Car"**):  
 firstIndex = 1;  
 **break**;  
 **case** (**"Cube"**):  
 firstIndex = 2;  
 **break**;  
 **default**:  
 firstIndex = 3;  
 }  
  
 *// Second object.* **switch** (second.getClass().getName()) {  
 **case** (**"Ball"**):  
 secondIndex = 0;  
 **break**;  
 **case** (**"Car"**):  
 secondIndex = 1;  
 **break**;  
 **case** (**"Cube"**):  
 secondIndex = 2;  
 **break**;  
 **default**:  
 secondIndex = 3;  
 }  
  
 **if** (firstIndex > secondIndex)  
 **return true**;  
  
 **return false**;  
 }  
  
}

*/\*\*  
 \* List interface with it's main methods.  
 \** ***@param <T>*** *Generic parameter.  
 \*/***public interface** ListInterface<T> {  
  
 */\*\*  
 \* Get array's element by index.  
 \** ***@param index*** *Index of searching element.  
 \** ***@return*** *Element from array by index.  
 \*/* **public** T get(**int** index);  
  
 */\*\*  
 \* Expand the array, if it's too small.  
 \*/* **public void** expand();  
  
 */\*\*  
 \* Get current size of the array.  
 \** ***@return*** *Size of the array.  
 \*/* **public int** size();  
  
 */\*\*  
 \* Show the array on the screen.  
 \*/* **public void** show();  
  
 */\*\*  
 \* Swap elements in the list.  
 \** ***@param i*** *Index of the first element.  
 \** ***@param j*** *Index of the second element.  
 \*/* **public void** swap(**int** i, **int** j);  
  
}  
  
  
*/\*\*  
 \* List implementation with it's main methods.  
 \** ***@param <T>*** *Generic parameter.  
 \*/***public class** List<T> **implements** ListInterface<T> {  
  
 **private** T[] **arr**; *// array to store items in the list* **private int currentSize**; *// current length of the array* **private int maxSize**; *// current maximum size of the array* **private** Class<T> **elementType**; *// type of elements in the array  
  
 /\*\*  
 \* List class constructor with one parameter: type of elements.  
 \*/* **public** List() {  
 **maxSize** = 15;  
 **currentSize** = 0;  
 }  
  
 */\*\*  
 \* List constructor with 2 parameters: type of elements and one element.  
 \** ***@param element*** *Element to add to the list.  
 \*/* **public** List(T element) {  
 **maxSize** = 15;  
 **currentSize** = 1;  
 **elementType** = (Class<T>) element.getClass().getSuperclass();  
 **arr** = (T[]) Array.*newInstance*(**elementType**, **maxSize**);  
 **arr**[0] = element;  
 }  
  
 */\*\*  
 \* Add element to the end of the array.  
 \** ***@param element*** *Element to push.  
 \*/* **public void** add(T element) {  
 *// Expand array if it's too small* **if** (**currentSize** >= **maxSize**) {  
 expand();  
 }  
  
 **if** (**elementType** == **null**) {  
 **elementType** = (Class<T>) element.getClass().getSuperclass();  
 **arr** = (T[]) Array.*newInstance*(**elementType**, **maxSize**);  
 }  
  
 **arr**[**currentSize**] = element;  
 **currentSize**++;  
 }  
  
 */\*\*  
 \* List constructor with 2 parameters: type of elements and array of elements  
 \* to put in this structure.  
 \** ***@param newArr*** *Array to put to the list.  
 \*/* **public** List(ArrayList<T> newArr) {  
 **maxSize** = 15;  
 **currentSize** = newArr.size();  
  
 *// Array is not empty* **if** (**currentSize** != 0) {  
 **elementType** = (Class<T>) newArr.get(0).getClass().getSuperclass();  
  
 **while** (newArr.size() > **maxSize**) {  
 expand();  
 }  
  
 **arr** = (T[]) Array.*newInstance*(**elementType**, **maxSize**);  
  
 **for** (**int** i = 0; i < newArr.size(); i++) {  
 **arr**[i] = newArr.get(i);  
 }  
 }  
 }  
  
 */\*\*  
 \* Get array's element by index.  
 \** ***@param index*** *Index of searching element.  
 \** ***@return*** *Element from array by index.  
 \*/* **public** T get(**int** index) {  
 **if** (index >= 0 && index < **currentSize**) {  
 **return arr**[index];  
 } **else** {  
 System.***err***.println(**"Index is out of range"**);  
 }  
  
 **return** (T) **null**;  
 }  
  
 */\*\*  
 \* Expand the array, if it's too small.  
 \*/* **public void** expand() {  
 **int** newSize = **maxSize** + (**int**)(**maxSize** \* 0.3);  
 T[] newArr = (T[]) Array.*newInstance*(**elementType**, newSize);  
  
 System.*arraycopy*( **arr**, 0, newArr, 0, **maxSize**);  
  
 **maxSize** = newSize;  
 **arr** = newArr;  
 }  
  
 */\*\*  
 \* Get current size of the array.  
 \** ***@return*** *Size of the array.  
 \*/* **public int** size() {  
 **return currentSize**;  
 }  
  
 */\*\*  
 \* Show the array on the screen.  
 \*/* **public void** show() {  
 **for** (**int** i = 0; i < **currentSize**; i++) {  
 System.***out***.println(**arr**[i]);  
 }  
 }  
  
 */\*\*  
 \* Swap elements in the list.  
 \** ***@param i*** *Index of the first element.  
 \** ***@param j*** *Index of the second element.  
 \*/* **public void** swap(**int** i, **int** j) {  
 **if** (i >= 0 && i < **currentSize** && j >= 0 && j < **currentSize**) {  
 T temp = **arr**[i];  
 **arr**[i] = **arr**[j];  
 **arr**[j] = temp;  
 } **else** {  
 System.***err***.println(**"One or both of indexes are out of range."**);  
 }  
 }  
  
}

**public class** Main {  
  
 **public static void** main(String[] args) {  
  
 *// Init game room's object to play with it.* GameRoom gameRoom = **new** GameRoom(23, 9);  
  
 gameRoom.playWithToys();  
  
 System.***out***.println(**"\n-- SORTED ------------------------------"**);  
  
 gameRoom.sortToys();  
 gameRoom.playWithToys();  
  
 System.***out***.println();  
  
 **int** min = 10;  
 **int** max = 13;  
  
 Toy firstToyFromRange = gameRoom.getFirstToyFromPriceRange(min, max);  
  
 **if** (firstToyFromRange != **null**) {  
 System.***out***.println(**"Toy from "** + min + **" to "** + max + **" is "** + firstToyFromRange.getToyName() + **"."**);  
 } **else** {  
 System.***out***.println(**"There is no toys from range ("** + min + **", "** + max + **")"**);  
 }  
  
 }  
  
}