COMPSCI 230 Assignment 3
2015 S1
Sample Solution v1.1

Part 1

Student ID
Student name

Method under test
public boolean addDevice()

Adding valid devices	
Add the **first valid device** with ID "1111" to an **empty list**	1. 'addDevice()' returns **'true'** 2. The list of controlled devices **contains 1** device 3. The list of controlled devices **contains ID "1111"**
Add the **last valid device** (sixth) with ID "1131" to the list	1. 'addDevice()' returns **'true'** 2. The list of controlled devices **contains 6** devices 3. The list of controlled devices **contains ID "1131"**
Add a **valid device** with ID "1311" to a **full list**	1. 'addDevice()' should returns **'false'** 2. The list of controlled devices **contains 6** devices 3. The list of controlled devices does **not contain ID "1311"**
Add a **valid device** with **duplicate ID** "1111" **already in the list**	1. IllegalArgumentException thrown 2. The list of controlled devices **contains 1** device 3. The list of controlled devices **contains ID "1111"**
Add **all four device types**	1. The list of controlled devices **contains 4** devices
Adding invalid devices	
Add a device with **ID 'null'**	1. NullPointerException thrown 2. The list of controlled devices **contains 0** devices 3. The list of controlled devices does **not contain ID 'null'**
Add a device with ID **too many digits** ("13119")	1. IllegalArgumentException thrown 2. The list of controlled devices **contains 0** devices 3. The list of controlled devices does **notcontain ID "13119"**
Add a device with ID **too few digits** ("131")	1. IllegalArgumentException thrown 2. The list of controlled devices **contains 0** devices 3. The list of controlled devices does **notcontain ID "131"**
Add a device with ID **integer and correct length but negative character** ("-345")	1. IllegalArgumentException thrown 2. The list of controlled devices **contains 0** devices 3. The list of controlled devices does **not contain ID "-345"**
Add a device with ID **integer and correct length but space charactcter** (" 345")	1. IllegalArgumentException thrown 2. The list of controlled devices **contains 0** devices 3. The list of controlled devices does **not contain ID " 345"**
Add device (ID "1111") with **negative operating range** (20, 19)	1. IllegalArgumentException thrown 2. The list of controlled devices **contains 0** devices 3. The list of controlled devices does **not contain ID "1111"**
Add device (ID "1111") with **negative safe range** (50, 49)	1. IllegalArgumentException thrown 2. The list of controlled devices **contains 0** devices 3. The list of controlled devices does **not contain ID "1111"**
Add device (ID "1111") with **lower safe range outside operating range** (30, 29)	1. IllegalArgumentException thrown 2. The list of controlled devices **contains 0** devices 3. The list of controlled devices does **not contain ID "1111"**
Add device (ID "1111") with upper **safe range outside operating range** (80, 81)	1. IllegalArgumentException thrown 2. The list of controlled devices **contains 0** devices 3. The list of controlled devices does **not contain ID "1111"**

Removing devices	
Remove only device ID "1111" from list succeeds	1. 'removeDevice()' returns 'true' 2. The list of controlled devices contains 0 devices 3. The list of controlled devices does not contain ID "1111"
Remove device ID "1111" not in list fails	1. 'removeDevice()' returns 'false'
Remove last device "1131" from full list succeeds	1. 'removeDevice()' returns 'true' 2. The list of controlled devices contains 5 devices 3. The list of controlled devices does not contain ID "1131"
Remove first device "1111" from full list succeeds	1. 'removeDevice()' returns 'true' 2. The list of controlled devices contains 5 devices 3. The list of controlled devices does not contain ID "1111"

Part 3

Five known (injected) bugs are all in class **Controller**

DEFECT 1:
public boolean addDevice(ControlDeviceType deviceType, String deviceID, int operatingMin, int operatingMax, int safeMin, int safeMax)

Second check after fields – *deviceID.matches()* has had *!* removed

Students have:

```
if (deviceID.equals("") || deviceID.length()!=4  ||  deviceID.matches(DIGITS_MASK)) {
            throw new IllegalArgumentException();
}
```

A solution:

```
if (deviceID.equals("") || deviceID.length()!=4  ||  !deviceID.matches(DIGITS_MASK)) {
            throw new IllegalArgumentException();
}
```

DEFECT 2:
public boolean addDevice(ControlDeviceType deviceType, String deviceID, int operatingMin, int operatingMax, int safeMin, int safeMax)

Fourth check after fields has been removed

Students have:

```
if (findDeviceIDInList(deviceID)) {
        throw new IllegalArgumentException();
}
```

A solution:

```
if (findDeviceIDInList(deviceID)) {
        throw new IllegalArgumentException();
}

if (nextIndex >= MAX_DEVICES) {
        inputsOk = false;
}
```

DEFECT 3:
public boolean removeDevice(String deviceID)

Check for non-empty list ('!nextIndex == 0') will reset 'inputsOk' to 'true' and so code will try to remove a device that is not in the list (previous check).

Students have:

```
if (!findDeviceIDInList(deviceID)) {
        inputsOk = false;
}

inputsOk = !(nextIndex == 0);
```

A solution:

```
inputsOk = !(nextIndex==0) && findDeviceIDInList(deviceID);
```

Or better (as findDeviceIDInList() returns false if the list is empty):

```
inputsOk = findDeviceIDInList(deviceID);
```

DEFECTS 4 and 5:
private boolean *findDeviceIDInList(String id)*

String IDs are compared with '==' instead of '.equals()'.
Loop moves through the whole array and so null pointer exception if uninstantiated array slot

Students have:

```
private boolean findDeviceIDInList(String id) {

	int i=0;
	boolean found = false;
	while  (!found && (i<controlledDevices.length)) {
		if (controlledDevices[i].getID()==id) {
			found = true;
		}
		i++;
	}
	return found;
}
```

A solution:

```
private boolean findDeviceIDInList(String id) {

	int i=0;
	boolean found = false;
	while  (!found && (i<nextIndex)) {
		if (controlledDevices[i].getID().equals(id)) {
			found = true;
		}
		i++;
	}
	return found;
}
```