#### **EXAM**

Java Desktop Application Development CST3613 Fall 2022

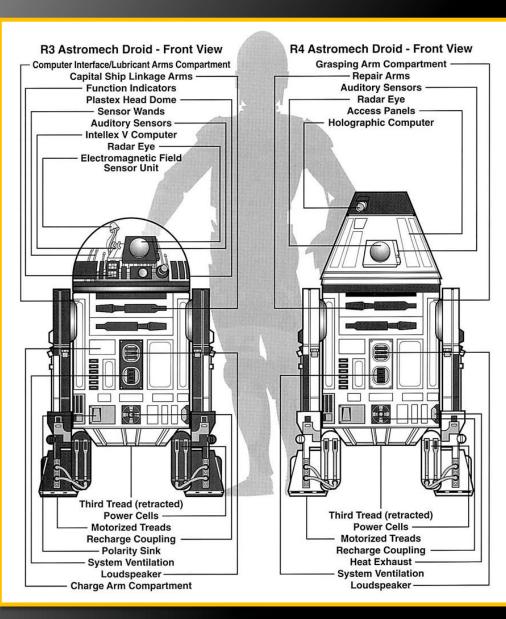


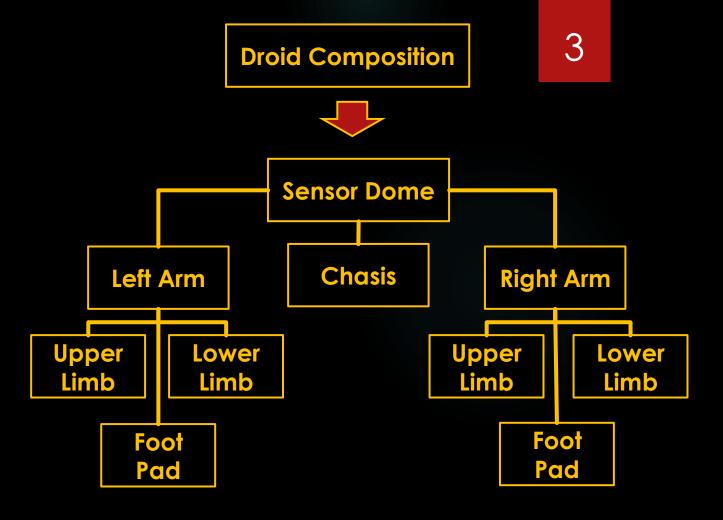
### MIDTERM EXAM

**COMPREHENSIVE OOP** 

### Exam Instructions

- This is your Midterm Exam it is worth 30 points and is designed to evaluate your understanding of Java OOP.
- Grading of this exam is binary.
  - 30 points if program follow specifications and produces expected output.
  - ▶ 10 points otherwise.
- Read all UML diagrams, context boxes, and method specification charts <u>carefully</u>.
- YOU MUST BE PRESENT IN CLASS TO TAKE THE EXAM.
- You have the entire class period to complete the exam.
- You must submit before the deadline of 9:40 to receive any points.
- Your submission must be a Compressed Eclipse project.
- You may use any resources you have during the exam.
- You may not communicate with anyone during the exam.
- ▶ Include the provided Gene.java file for testing of your program.





# Program Structure

□ Package Explorer × ✓ 

LocklearMidterm\_3613Fall2022 > M JRE System Library [JavaSE-17] ✓ 

Æ

Src ▼ 

⊞ locklear.ARMS > Arm.java > 🚺 LeftArm.java > II RightArm.java > Chasis.java > SensorDome.java ▼ A locklear.DROID > A AstromechDroid.java > R3.java > A R4.java > 🎤 Battery.java > 🗗 Limb.java > 🧗 Radar.java

> ☐ Side.java
> ☐ Status.java

✓ ☐ locklear.FACTORY
> ☐ DroidFactory.java
> ☐ R3Factory.java
> ☐ R4Factory.java

✓ ☐ locklear.INTERFACES
> ☐ Displayable.java
> ☐ Droid.java

✓ ☐ locklear.MAIN
> ☐ Gene.java

✓ ☐ locklear.PAD
> ☐ FootPad.java
> ☐ LeftFootPad.java
> ☐ RightFootPad.java

Organize your program <u>exactly</u> as shown. Substitute your name where you see mine.

### AstromechDroid Class

## <<Abstract>> AstromechDroid

-serialNumber: String

-height: double

-weight: double

-dome: SensorDome

-chasis: Chasis

-leftArm: LeftArm

-rightArm: RightArm

+AstromechDroid(String serialNumber)

+abstract checkStatus(): void

#### **R3**

-R3Status: Status -R3Battery: Battery

R3(String serialNumber)

+displayDroid(): void +checkStatus(): void

#### **R4**

-R4Status: Status

-R4Battery: Battery

-R4Radar: Radar

R4(String serialNumber)

+displayDroid(): void

+checkStatus(): void

## <<Interface>> Droid

+abstract displayDroid(): void

#### AT INITILIZATION:

R3 Height is **SensorDome Height + Chasis Height** 

R4 Height is **SensorDome Height + Chasis Height** 

R3 Weight is **SensorDome Weight + Chasis Height** 

R4 Weight is **SensorDome Weight + Chasis Weight** 

R3Status and R4Status are 'ONLINE'

R3Battery is R3

R4Battery is R4

R4Radar is R4R

**ALL** subclasses **must use** their <u>superclass</u> constructor.

The initialization of **ALL** Object State **must occur** inside the <u>subclass</u> constructor.

### Chasis Class

#### Chasis

-serialNumber: String

-height: double-weight: double-status: Status

+Chasis(String serialNumber)

+chasisCheck(): boolean

#### AT INITILIZATION:

Status is **ONLINE** 

**serialNumber** = serialNumber of the AstromechDroid

AstromechDroid	Height	Weight
R3	4	400
R4	5	500

### SensorDome Class

### SensorDome

-serialNumber: String

-height: double-weight: double-status: Status

+SensorDome(String serialNumber)

+sensorDomeCheck(): boolean

#### AT INITILIZATION:

Status is **ONLINE** 

**serialNumber** = serialNumber of the AstromechDroid

AstromechDroid	Height	Weight
R3	2	200
R4	2	150

### Arm Class

## <<Abstract>> Arm

-serialNumber: String

-side: Side

-upper: Limb

-lower: Limb

-pad: FootPad

+Arm(String serialNumber)

+abstract armCheck(): boolean

#### **LeftArm**

-serialNumber = "LA-01"

-status = ONLINE

-side = LEFT

-pad = LeftFootPad

-upper = Upper

-lower = Lower

+LeftArm(String serialNumber)

+armCheck(): boolean

### **RightArm**

-serialNumber = "RA-02"

-status = ONLINE

-side = RIGHT

-pad = RightFootPad

-upper = Upper

-lower = Lower

+RightArm(String serialNumber)

+armcheck(): boolean

**ALL** subclasses **must use** their superclass constructor.

The initialization of **ALL** Object State **must occur** inside the <u>subclass</u> constructor.

### FootPad Class

## <<Abstract>> FootPad

-serialNumber: String

-side: Side

FootPad(String serialNumber)

+abstract padCheck(): boolean

#### LeftFootPad

- -serialNumber = 'LFP-1'
- -side = LEFT
- -LeftPadStatus = ONLINE
- +LeftFootPad(String serialNumber)
- +padCheck(): boolean

### RightFootPad

- -serialNumber = 'RFP-2'
- -side = RIGHT
- -RightPadStatus = ONLINE
- +RightFootPad(String serialNumber)
- +padCheck(): boolean

**ALL** subclasses **must use** their superclass constructor.

The initialization of **ALL**Object State **must occur**inside the <u>subclass</u>
constructor.

### Enumerations

### Side

LEFT,RIGHT

### Status

ONLINE, OFFLINE

### Limb

Upper("Upper",1)
Lower("Lower",2)

-type: String -value: int

-Limb(String type, int value)

### **Battery**

R3("Lithium",1000) R4("Trithium",2000)

-type: String -amps: int

-Battery(String type, int amps)

### Radar

R4R("Doppler",500)

-type: String -range: int

-Radar(String type, int range)

# **DroidFactory Class**

## <<Abstract>> DroidFactory

- -factoryID: String
- -droidStorage: ArrayList<AstromechDroid>
- +DroidFactory(String factoryID)
- +abstract buildDroids(int count): boolean

### **R4Factory**

- +R3Factory(String factoryID)
- +buildDroids(int count): boolean

**R3Factory** 

+displayAllDroids():void

+R4Factory(String factoryID)

+buildDroids(int count): boolean

+displayAllDroids(): void

<<Interface>>
Displayable

+abstract displayAllDroids(): void

**ALL** subclasses **must use** their <u>superclass</u> constructor.

The initialization of **ALL** Object State **must occur** inside the <u>subclass</u> constructor.

AstromechDroid serial numbers start with R3-000 and R4-000 respectively and increment by one for each R3 and R4 droid created.

# Method Specifications

Class	Method	Input	Processing
R3	displayDroid	None	Displays as information about the R3 as shown in the Expected Console Output
R4	displayDroid	None	Displays as information about the R4 as shown in the Expected Console Output
R3	checkStatus	None	Checks that the status of the SensorDome, Chasis, Left Arm, and Right Arm are ONLINE if true sets the status of the R3 to ONLINE and prints "R3 Astromech is ONLINE" to the Log if false sets the status of the R3 to OFFLINE and prints "R3 Astromech is OFFLINE"
R4	checkStatus	None	Checks that the status of the SensorDome, Chasis, Left Arm, and Right Arm are ONLINE if true sets the status of the R4 to ONLINE and prints "R4 Astromech is ONLINE" to the Log if false sets the status of the R4 to OFFLINE and prints "R4 Astromech is OFFLINE"
LeftArm	armCheck	None	Checks that status of the LeftArmStatus is ONLINE and the status of the its pad is also ONLINE if so, returns true otherwise sets the LeftArmStatus to OFFLINE and returns false.
RightArm	armCheck	None	Checks that status of the RightArmStatus is ONLINE and the status of the its pad is also ONLINE if so, returns true otherwise sets the RightArmStatus to OFFLINE and returns false.
LeftFootPad	padCheck	None	Checks that status of the LeftPadStatus is ONLINE and the status of the its pad is also ONLINE if so, returns true otherwise sets the LeftPadStatus to OFFLINE and returns false.
RightFootPad	padCheck	None	Checks that status of the RightPadStatus is ONLINE and the status of the its pad is also ONLINE if so, returns true otherwise sets the RightPadStatus to OFFLINE and returns false.

# Method Specifications

Class	Method	Input	Processing
SensorDome	sensorDomeCheck	None	Checks that the status is ONLINE and if so, returns true otherwise returns false.
Chasis	chasisCheck	None	Checks that the status is ONLINE and if so, returns true otherwise returns false.
R3Factory	buildDroids	count	Creates the specified number of R3s and adds them to the droidStorage attribute and returns true
R4Factory	buildDroids	count	Creates the specified number of R4s and adds them to the droidStorage attribute and returns true
R3Factory	displayAllDroids	None	Call the displayDroid method for all R3s in the droidStorage attribute
R4Factory	displayAllDroids	None	Call the displayDroid method for all R4s in the droidStorage attribute

### Gene Class

```
6 public class Gene {
                                                              Use the Gene.java file provided
                                                              substitute your name where you see
 80
       public static void main(String[] args) {
                                                              mine. Otherwise, Do not alter the code
           R3Factory R3F = new R3Factory("R3FAC");
           R4Factory R4F = new R4Factory("R4FAC");
                                                              or add any additional code to this file.
10
11
12
           System.out.println();
13
           R3F.buildDroids(1);
14
           R4F.buildDroids(1);
15
16
           R3F.displayAllDroids();
           System.out.println();
17
18
           R4F.displayAllDroids();
19
20
           R3F.getDroidStorage().get(0).getLeftArm().setLeftArmStatus(Status.OFFLINE);
21
           R3F.getDroidStorage().get(0).checkStatus();
22
23
24
25 }
```

# **Expected Output**

Problems @ Javadoc Declaration Console X

<terminated> Gene (2) [Java Application] C:\Users\GeneLocklear\_fea30p7\.p2\pool\plu

R3 Astromech
Serial Number: R3-000
Status: ONLINE
Battery: Lithium
Sensor Dome Serial Number R3-000
Chasis Serial Number R3-000
Left Arm Serial Number LA-01
Right Arm SerialNumber RA-02

R4 Astromech

Serial Number: R4-000

Status: ONLINE

Battery: Trithium

Sensor Dome Serial Number R4-000

Chasis Serial Number R4-000

Left Arm Serial Number LA-01

Right Arm SerialNumber RA-02

R3 Astromech is OFFLINE

Your Console Output should look <u>exactly</u> as shown.