Lab: Prototypes and Inheritance

Problems for exercises and homework for the "JavaScript Applications" course @ SoftUni. Submit your solutions in the SoftUni Judge system at https://judge.softuni.bg/Contests/2770/Prototypes-and-Inheritance-Lab

1. Person

Write a JS program which takes first & last names as parameters and returns an object with firstName, lastName and fullName ("{firstName} {lastName}") properties which should be all accessible, we discovered that "accessible" also means "mutable". This means that:

- If firstName or lastName have changed, then fullName should also be changed.
- If **fullName** is changed, then **firstName** and **lastName** should also be changed.
- If **fullName** is **invalid**, you should not change the other properties.
- A valid full name is in the format: "{firstName} {lastName}".

Examples

```
Sample Input
let person = new Person("Peter", "Ivanov");
console.log(person.fullName); //Peter Ivanov
person.firstName = "George";
console.log(person.fullName); //George Ivanov
person.lastName = "Peterson";
console.log(person.fullName); //George Peterson
person.fullName = "Nikola Tesla";
console.log(person.firstName); //Nikola
console.log(person.lastName); //Tesla
let person = new Person("Albert", "Simpson");
console.log(person.fullName); //Albert Simpson
person.firstName = "Simon";
console.log(person.fullName); //Simon Simpson
person.fullName = "Peter";
console.log(person.firstName); // Simon
console.log(person.lastName); // Simpson
```

2. Person and Teacher

Write a class **Person** and a class **Teacher** which extends **Person**.

- The **Person** class should have a **name** and an **email**
- The **Teacher** class should have a **name**, an **email**, and a **subject**

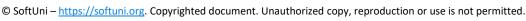
Input \ Output

There will be **NO** input. Your function should return an object containing the classes **Person** and **Teacher**.

Hints:

template.js



















```
function personAndTeacher() {
    // TODO:
    return {
        Person,
        Teacher
    }
```

3. Inheriting and Replacing ToString

Extend the Person and Teacher from the previous task and add a class Student inheriting from Person with additional property course. Add toString() functions to all classes, the formats should be as follows:

```
Person - returns "Person (name: {name}, email: {email})"
Student - returns "Student (name: {name}, email: {email}, course: {course})"
Teacher - returns "Teacher (name: {name}, email: {email}, subject: {subject})"
```

Try to reuse code by using the **toString()** function of the base class.

Input / Output

There will be **NO** input. Your function should return an object containing the classes **Person**, **Teacher**, and Student.

Hints:

```
template.js
function toStringExtension() {
    // TODO:
    return {
        Person,
        Teacher,
        Student
    }
}
```

4. Extend Prototype

Write a function that receives a class and attaches to it a property species with the value "Human" and a function toSpeciesString(). When called, the function returns a string with the format:

```
"I am a <species>. <toString()>"
```

The function **toString()** is called from the current instance (call using **this**).

Input / Output

Your function will receive a class whose prototype it should extend. There is NO output, your function should only attach the properties to the given class' prototype.

template.js



















```
function extendProrotype(classToExtend) {
    // TODO:
}
```

5. Class Hierarchy

Write a function that returns 3 classes - Figure, Circle, and Rectangle.

Figure:

- Should have property units ("m", "cm", "mm") with default value "cm"
- Should have a getter area
- Has method **changeUnits** that sets different units for that figure
- Has method toString, which returns: `Figures units: {units}`

Circle:

- Extends Figure
- Has a property radius
- Overrides area getter to return the area of the Circle (PI * r * r)
- toString() should return a string representation of the figure in the format:

```
`Figures units: {type} Area: {area} - radius: {radius}`
```

Rectangle:

- Extends Figure
- Has properties width, height, and units (extended from the class Figure)
- Overrides area getter to return the area of the Rectangle (width * height)
- **toString()** should return a string representation of the figure in the format:

```
`Figures units: {type} Area: {area} - width: {width}, height: {height}`
```

Note: All Parameters Passed in the Constructors Are in Centimeters ("cm")

Input / Output

There will be no input. Your function should return an object containing the Figure, Circle, and Rectangle classes.

Examples

This code demonstrates how your classes should behave:

```
Sample Code
let c = new Circle(5);
console.log(c.area); // 78.53981633974483
console.log(c.toString()); // Figures units: cm Area: 78.53981633974483 - radius: 5
let r = new Rectangle(3, 4, 'mm');
console.log(r.area); // 1200
console.log(r.toString()); //Figures units: mm Area: 1200 - width: 30, height: 40
r.changeUnits('cm');
console.log(r.area); // 12
```











```
console.log(r.toString()); // Figures units: cm Area: 12 - width: 3, height: 4
c.changeUnits('mm');
console.log(c.area); // 7853.981633974483
console.log(c.toString()) // Figures units: mm Area: 7853.981633974483 - radius: 50
```















