**Tutorial 3**

# Exercise 1

## Code:

/\*  
 \* Developed by Muiz Uvais on 10/16/18 9:42 AM.  
 \* Last modified 10/16/18 9:36 AM.  
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 \*/  
//Circle Class  
public class Circle {  
 //Radius of the Circle  
 private double radius;  
 //Color of the circle  
 private String color = **"blue"**;  
  
 //No argument Constructor  
 public Circle() {  
 }  
  
 //Radius Argument Constructor  
 public Circle(double radius) {  
 this.radius = radius;  
 }  
  
 //Radius and Color argument constructor  
 public Circle(double radius, String color) {  
 this.radius = radius;  
 this.color = color;  
 }  
  
 //Getter for radius  
 public double getRadius() {  
 return radius;  
 }  
  
 //Setter for radius  
 public void setRadius(double radius) {  
 this.radius = radius;  
 }  
  
 //Getter for Color  
 public String getColor() {  
 return color;  
 }  
  
 //Stter for Color  
 public void setColor(String color) {  
 this.color = color;  
 }  
  
 //Getter for Area  
 public double getArea() {  
 return Math.*PI* \* Math.*pow*(this.radius, 2);  
 }  
  
 //toString Method  
 **@Override** public String toString() {  
 return **"Circle{"** +  
 **"radius="** + radius +  
 **", color='"** + color + **'**\'**'** +  
 **'}'**;  
 }  
  
}  
//Cylinder Class inherited from the Circle Class  
class Cylinder extends Circle {  
 //Instance Variable Height  
 private double height = 1;  
  
 //No argument Constructor for the Cylinder  
 public Cylinder() {  
 super();  
 height = 1;  
 }  
 //Height Argument constructor ofr the cylinder  
 public Cylinder(double height) {  
 this.height = height;  
 }  
 //Height and Radius Argument constructor ofr the cylinder  
 public Cylinder(double radius, double height) {  
 super(radius);  
 this.height = height;  
 }  
 //Height, Radius and, Color Argument constructor ofr the cylinder  
 public Cylinder(double radius, String color, double height) {  
 super(radius, color);  
 this.height = height;  
 }  
 //Getter for height  
 public double getHeight() {  
 return height;  
 }  
 //Setter for Height  
 public void setHeight(double height) {  
 this.height = height;  
 }  
 //Overridden getter for Area  
 **@Override** public double getArea() {  
 return (2 \* Math.*PI* \* this.getRadius() \* this.height) + (2 \* super.getArea());  
 }  
 //getter for Volume  
 public double getVolume() {  
 return super.getArea() \* this.height;  
 }  
  
 //toString Method  
 **@Override** public String toString() {  
 return **"Cylinder: subclass of "** + super.toString() + **" height="** + height;  
 }  
}  
//Tester Class  
class TestCylinder {  
 public static void main(String[] args) {  
// Declare and allocate a new instance of cylinder  
 Cylinder c1 = new Cylinder();  
 System.*out*.println(**"Cylinder:"** + **" radius="** + c1.getRadius()  
 + **" height="** + c1.getHeight()  
 + **" base area="** + c1.getArea()  
 + **" volume="** + c1.getVolume());  
// Declare and allocate a new instance of cylinder, specifying Height  
 Cylinder c2 = new Cylinder(5.0);  
 System.*out*.println(**"Cylinder:"** + **" radius="** + c2.getRadius()  
 + **" height="** + c2.getHeight()  
 + **" base area="** + c2.getArea()  
 + **" volume="** + c2.getVolume());  
// Declare and allocate a new instance of cylinder specifying radius and height  
 Cylinder c3 = new Cylinder(5.0, 10.0);  
  
  
 System.*out*.println(**"Cylinder:"** + **" radius="** + c3.getRadius()  
 + **" height="** + c3.getHeight()  
 + **" base area="** + c3.getArea()  
 + **" volume="** + c3.getVolume());  
 System.*out*.println(**"Area of Circle: "** + new Circle(5).getArea() + **"**\n**Area of Cylinder: "** + new Cylinder(5, 2).getArea());  
 }  
}

## Output:

Cylinder: radius=0.0 height=1.0 base area=0.0 volume=0.0

Cylinder: radius=0.0 height=5.0 base area=0.0 volume=0.0

Cylinder: radius=5.0 height=10.0 base area=471.23889803846896 volume=785.3981633974483

Area of Circle: 78.53981633974483

Area of Cylinder: 219.9114857512855

# Exercise 2

## Code:

/\*  
 \* Developed by Muiz Uvais on 10/16/18 10:14 AM.  
 \* Last modified 10/16/18 10:05 AM.  
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 \*/  
//Person Class  
public class Person {  
 protected String myName; // name of the person  
 protected int myAge; // person’s age  
 protected String myGender; // “M” for male, “F” for female  
  
 public Person(String name, int age, String gender) {//Constructor for the Person Class  
 super();  
 myName = name;  
 myAge = age;  
 myGender = gender;  
 }  
  
  
 public String getMyName() {  
 return myName;  
 } //Getter for the name  
  
 public void setMyName(String myName) {  
 this.myName = myName;  
 }//Setter for the name  
  
 public int getMyAge() {  
 return myAge;  
 }//getter for my age  
  
 public void setMyAge(int myAge) {  
 this.myAge = myAge;  
 } //setter for my age  
  
 public String getMyGender() {  
 return myGender;  
 }//getter for my gender  
  
 public void setMyGender(String myGender) {  
 this.myGender = myGender;  
 }//setter for my gender  
  
 //toString Method  
 public String toString() {  
  
 return this.myName + **",age: "** + this.myAge + **",gender:"** + this.myGender;  
 }  
  
}

/\*  
 \* Developed by Muiz Uvais on 10/16/18 9:58 AM.  
 \* Last modified 10/16/18 9:58 AM.  
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 \*/  
//Student Class  
public class Student extends Person {  
 private int idNumber;  
 private double fee;  
 private int grade;  
  
 //Student Constructor  
 public Student(String name, int age, String gender, int idNumber) {  
 super(name, age, gender);  
 this.idNumber = idNumber;  
 this.grade = grade;  
 }  
  
 //Getter for the Id Number  
 public int getIdNumber() {  
 return idNumber;  
 }  
  
 //Setter for the Id number  
 public void setIdNumber(int idNumber) {  
 this.idNumber = idNumber;  
 }  
  
 //Getter for the fee  
 public double getFee() {  
 return fee;  
 }  
  
 //Setter for the fee  
 public void setFee(double fee) {  
 this.fee = fee;  
 }  
  
 //Getter for the grade  
 public int getGrade() {  
 return grade;  
 }  
  
 //setter for the grade  
 public void setGrade(int grade) {  
 this.grade = grade;  
 }  
  
 //toString Method  
 **@Override** public String toString() {  
 return super.toString() + **" id number: "** + this.idNumber + **", fee: "** + this.fee + **" ,grade: "** + this.grade;  
 }  
}

/\*  
 \* Developed by Muiz Uvais on 10/16/18 10:15 AM.  
 \* Last modified 10/16/18 10:10 AM.  
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 \*/  
//Class for the teacher  
public class Teacher extends Person {  
 private double salary;  
 private String subject;  
  
 //Constructor for teacher  
 public Teacher(String name, int age, String gender, String subject, double salary) {  
 super(name, age, gender);  
 this.salary = salary;  
 this.subject = subject;  
 }  
  
 //Getter for Salary  
 public double getSalary() {  
 return salary;  
 }  
  
 //Setter for salary  
 public void setSalary(double salary) {  
 this.salary = salary;  
 }  
  
 //Getter for subject  
 public String getSubject() {  
 return subject;  
 }  
  
 //Setter for Subject  
 public void setSubject(String subject) {  
 this.subject = subject;  
 }  
  
 //toString Method  
 **@Override** public String toString() {  
 return super.toString() + **" salary: "** + this.salary + **", Subject: "** + this.subject;  
 }  
}

/\*  
 \* Developed by Muiz Uvais on 10/16/18 10:08 AM.  
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 \*/  
  
public class Test {  
 public static void main(String[] args) {  
 //Examples given in the Exercise to display  
 Person jack = new Person(**"Jack Brooke"**, 27, **"M"**);  
 System.*out*.println(jack);  
 Student beth = new Student(**"Elisabeth Smith"**, 16, **"F"**, 122233);  
 System.*out*.println(beth);  
 Teacher sam = new Teacher(**"Sam Hamilton"**, 34, **"M"**, **"Computer Science"**,  
 50000);  
 System.*out*.println(sam);  
 //To identify if the code is correct  
 Person p = new Teacher(**"Sam Hamilton"**, 34, **"M"**, **"Computer Science"**, 50000);//Correct Statement  
 Teacher t = new Person(**"Sam Hamilton"**, 34, **"M"**, **"Computer Science"**, 50000);//Wrong Statement (Compilation error)  
 Person s = new Student(**"Elisabeth Smith"**, 16, **"F"**, 122233);//Correct Statement  
 }  
}

## Output:

### Without Teacher t Object

Jack Brooke,age: 27,gender:M

Elisabeth Smith,age: 16,gender:F id number: 122233, fee: 0.0 ,grade: 0

Sam Hamilton,age: 34,gender:M salary: 50000.0, Subject: Computer Science

### With Teacher t Object

Error:(19, 21) java: constructor Person in class Person cannot be applied to given types;

required: java.lang.String,int,java.lang.String

found: java.lang.String,int,java.lang.String,java.lang.String,int

reason: actual and formal argument lists differ in length