**Problem statement:**

**Given a java class HeavenlyBody below, complete the code with overriding equals() and hashCode() methods**

**Class:**

**import** java.util.HashSet;  
**import** java.util.Set;  
  
**public final class** HeavenlyBody {

**private final** String **name**;  
 **private final double orbitalPeriod**;  
 **private final** Set<HeavenlyBody> **satellites**;  
  
 **public** HeavenlyBody(String name, **double** orbitalPeriod) {  
 **this**.**name** = name;  
 **this**.**orbitalPeriod** = orbitalPeriod;  
 **this**.**satellites** = **new** HashSet<>();  
 }  
  
 **public** String getName() {  
 **return name**;  
 }  
  
 **public double** getOrbitalPeriod() {  
 **return orbitalPeriod**;  
 }  
  
 **public boolean** addMoon(HeavenlyBody moon) {  
 **return this**.**satellites**.add(moon);  
 }  
  
 **public** Set<HeavenlyBody> getSatellites() {  
 **return new** HashSet<>(**this**.**satellites**);  
 }

@Override  
 public int hashCode() {  
 System.out.println("hashcode called");

return Objects.hash(name, orbitalPeriod, satellites);  
 }

@Override  
 public boolean equals(Object obj) {  
 if (this == obj)  
 return true;  
 if (obj == null)  
 return false;  
 if (getClass() != obj.getClass())  
 return false;  
 HeavenlyBody other = (HeavenlyBody) obj;  
 return Objects.equals(name, other.name)  
 && Double.doubleToLongBits(orbitalPeriod) == Double.doubleToLongBits(other.orbitalPeriod)  
 && Objects.equals(satellites, other.satellites);

}

}

**Main Class:**

**import** java.util.HashMap;  
**import** java.util.HashSet;  
**import** java.util.Map;  
**import** java.util.Set;  
  
**public class** Main {  
 **private static** Map<String, HeavenlyBody> *solarSystem* = **new** HashMap<>();  
 **private static** Set<HeavenlyBody> *planets* = **new** HashSet<>();  
  
 **public static void** main(String[] args) {  
 HeavenlyBody temp = **new** HeavenlyBody(**"Mercury"**, 88);  
 *solarSystem*.put(temp.getName(), temp);  
 *planets*.add(temp);  
  
 temp = **new** HeavenlyBody(**"Venus"**, 225);  
 *solarSystem*.put(temp.getName(), temp);  
 *planets*.add(temp);  
  
 temp = **new** HeavenlyBody(**"Earth"**, 365);  
 *solarSystem*.put(temp.getName(), temp);  
 *planets*.add(temp);  
  
 HeavenlyBody tempMoon = **new** HeavenlyBody(**"Moon"**, 27);  
 *solarSystem*.put(tempMoon.getName(), tempMoon);  
 temp.addMoon(tempMoon);  
  
 temp = **new** HeavenlyBody(**"Mars"**, 687);  
 *solarSystem*.put(temp.getName(), temp);  
 *planets*.add(temp);  
  
 tempMoon = **new** HeavenlyBody(**"Deimos"**, 1.3);  
 *solarSystem*.put(tempMoon.getName(), tempMoon);  
 temp.addMoon(tempMoon); *// temp is still Mars* tempMoon = **new** HeavenlyBody(**"Phobos"**, 0.3);  
 *solarSystem*.put(tempMoon.getName(), tempMoon);  
 temp.addMoon(tempMoon); *// temp is still Mars* temp = **new** HeavenlyBody(**"Jupiter"**, 4332);  
 *solarSystem*.put(temp.getName(), temp);  
 *planets*.add(temp);  
  
 tempMoon = **new** HeavenlyBody(**"Io"**, 1.8);  
 *solarSystem*.put(tempMoon.getName(), tempMoon);  
 temp.addMoon(tempMoon); *// temp is still Jupiter* tempMoon = **new** HeavenlyBody(**"Europa"**, 3.5);  
 *solarSystem*.put(tempMoon.getName(), tempMoon);  
 temp.addMoon(tempMoon); *// temp is still Jupiter* tempMoon = **new** HeavenlyBody(**"Ganymede"**, 7.1);  
 *solarSystem*.put(tempMoon.getName(), tempMoon);  
 temp.addMoon(tempMoon); *// temp is still Jupiter* tempMoon = **new** HeavenlyBody(**"Callisto"**, 16.7);  
 *solarSystem*.put(tempMoon.getName(), tempMoon);  
 temp.addMoon(tempMoon); *// temp is still Jupiter* temp = **new** HeavenlyBody(**"Saturn"**, 10759);  
 *solarSystem*.put(temp.getName(), temp);  
 *planets*.add(temp);  
  
 temp = **new** HeavenlyBody(**"Uranus"**, 30660);  
 *solarSystem*.put(temp.getName(), temp);  
 *planets*.add(temp);  
  
 temp = **new** HeavenlyBody(**"Neptune"**, 165);  
 *solarSystem*.put(temp.getName(), temp);  
 *planets*.add(temp);  
  
 temp = **new** HeavenlyBody(**"Pluto"**, 248);  
 *solarSystem*.put(temp.getName(), temp);  
 *planets*.add(temp);  
  
 System.***out***.println(**"Planets"**);  
 **for**(HeavenlyBody planet : *planets*) {  
 System.***out***.println(**"\t"** + planet.getName());  
 }  
  
 HeavenlyBody body = *solarSystem*.get(**"Mars"**);  
 System.***out***.println(**"Moons of "** + body.getName());  
 **for**(HeavenlyBody jupiterMoon: body.getSatellites()) {  
 System.***out***.println(**"\t"** + jupiterMoon.getName());  
 }  
  
 Set<HeavenlyBody> moons = **new** HashSet<>();  
 **for**(HeavenlyBody planet : *planets*) {  
 moons.addAll(planet.getSatellites());  
 }  
  
 System.***out***.println(**"All Moons"**);  
 **for**(HeavenlyBody moon : moons) {  
 System.***out***.println(**"\t"** + moon.getName());  
 }  
 }  
}

**Expected output:**

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

Planets

Uranus

Mercury

Pluto

Earth

Jupiter

Mars

Neptune

Saturn

Venus

Moons of Mars

hashcode called

hashcode called

Deimos

Phobos

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

hashcode called

All Moons

Europa

Callisto

Ganymede

Deimos

Phobos

Moon

Io