Design Document for Stage 1

Design Diagram

```
              CelestialBody
   ----------------------------------
              name(String)
              RA(Double)
              dec(Double)
              mag(Double)
              Dis(Double)
   ----------------------------------
             getDec():Double
             getDis():Double
             getMag():Double
             getNmae():String
             getRA():Double
             setDec(Double):void
             setDis(Double):void
             setMag(Double):void
             setNmae(String):void
             setRA(Double):void
```

```
              SummaryStatistic
   --------------------------------------------------------------------------
       celestialBodys(TreeSet<CelestialBody>)
            messiers(List<Messier>)
            Planets(List<Planets>)
              stars(TreeSet<Stars>)
              stars2(TreeSet<Stars>)
         TempMap(TreeMap<String,Integer>)
   --------------------------------------------------------------------------
   SummaryStatistics(TreeMap<String,Integer>,TreeSet<CelestialBody>,TreeSet<Stars>,List<Planet>,List<Messier>)
         getCelestialBodys():TreeSet<CelestialBody>
              getMessier():List<Messier>
              getPlanets():List<Planets>
              getStars():TreeSet<Stars>
              getStars2():TreeSet<Stars>
         getTempMap():TreeMap<String,Integer>
       setCelestialBodys(TreeSet<CelestialBody>):void
            getMessier(List<Messier>):void
            getPlanets(List<Planets>):void
            getStars(TreeSet<Stars>):void
            getStars2(TreeSet<Stars>):void
       getTempMap(TreeMap<String,Integer>):void
```

```
   inherited                              inherited
```

```
      Planet
   ----------------
      alb(Double)
   ----------------
    getAlb():Double
```

```
         Constellation
   -----------------------
           Con(String)
   -----------------------
         getCon():String
```

```
              involved
```

```
              AOB
   --------------------------------------------------------------------------
   getSummaryStatistics(TreeMap<String,Integer>,TreeSet<CelestialBody>,TreeSet<Stars>,List<Planet>,List<Messier>):SummaryStatistics
            AOB(String,String,String)
          toString(SummaryStatistics):void
              main(String[]):void
```

```
   inherited          inherited
```

```
       Messier
   ---------------
      des(String)
   ---------------
    getDes():String
```

```
         Star
   ---------------
     starType(String)
   ---------------
    getStarType(String)
```

```
   involved        involved        involved
```

```
      Comparator1                    Comparator2                    Comparator3
   -------------------            -------------------            -------------------
   Compare(CelestialBody,CelestialBody):int   Compare(Stars,Stars):int   Compare(Stars,Stars):int
```
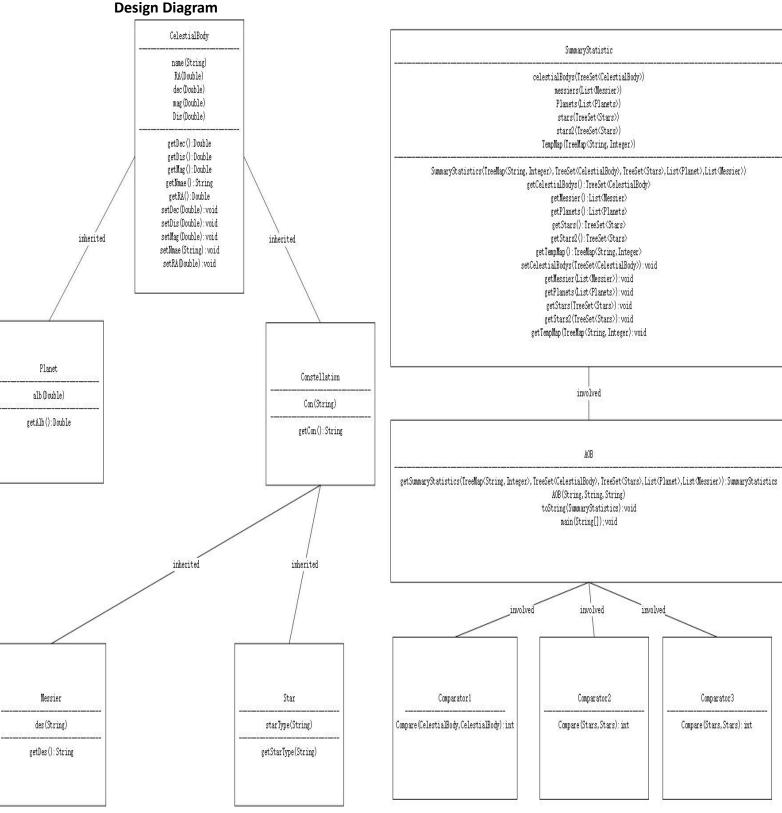
Justification of classes design

- **CelestialBody**: The **CelestialBody** class is the superclass of **Constellation, Plant, Stars** and **Messier**. The usage of the data in this class is to compare the distance

properties more efficiently.
- **Constellation**: The Constellation class is the superclass of Stars and Messier, the data in this class is used to gain the number of the constellations and the constellation which has the largest number of members.
- **Planet**: This class is used to store the data from **Planets.txt** and also the data in this class can gain the number of the planets.
- **Stars**: This class is to store the data from **Stars.txt**. What's more, the data in this class can help gain the number of the stars, the nearest star, the brightest and the faintest star. - Messier: This class helps to store the data from Messier.txt.
- **Comparator1,2,3**: these classes contain Comparator method.
- **SummaryStatistics:** This class is to integrate all the Set, Map and List data and can output at the same time.
- **AOB:** This class is to collect the data in file, sort the data in the appropriate way and that output the data. It has tree method: **AOB (…)**, **getSummaryStatistics()** and **toString()**.

Collections framework
- **Set<CelestialBody>:** Set collection helps to store all the data in CelestialBody class and to sort into an ordered sequence. Now this Set is ordered because of the TreeSet, then the Comparator method can be used to sort the Set according to the distance property. In here, List takes more time to search the data and Map is not that use as Set, so I choose Set to achieve the requirement.
- **Set<Stars>:** This Set collection is used to Store all the data in Stars class and to also sort into an ordered sequence. In here I still use treeSet and Comparator method. In the program it has 2 Set<Stars>, one is to sort the distance and another one is to compare the magnitude.
- **List:** In this assignment I create many lists to store the data. I create **List<Planet>** and **List<Messier>** to calculate the number of the planets and messier. **List Q1-Q10** is to store the answer of each question.
- **Map<String, Integer>:** This Map collection is to calculate the number and the types of constellations in the stars and messier. **String** represent the name of the constellation and **Integer** represent the number of this constellation in the stars and messier list.

What I have learnt
- **TreeSet & TreeMap:** In this Stage, I use TreeSet with the Comparator to compare the distance of each celestial body and each star to the Earth, to gain the brightest and faintest star number. I use the TreeMap to iterate whole Constellation class and finally gain the number of constellations and the constellation which has the largest number of members.
- **Comparator & Comparable:** At the first time, I tried to use Comparable method to implement the comparison functions but I felt it is too complicated. I searched on the Internet and found that Comparator method is more flexible because it can be called directly.