UOW MALAYSIA KDU PENANG UNIVERSITY COLLEGE

PART OF THE UNIVERSITY OF WOLLONGONG AUSTRALIA GLOBAL NETWORK

ASSIGNMENT COVER PAGE

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Programme	**Course Code and Title**
Bachelor of Computer Science (Hons)/ Bachelor of Computer Science (Hons) In Computer & Network Technology/ Bachelor of Software Engineering (Hons)	CPR3113/N Principles of Programming
Student's name / student's id	**Lecturer's name**
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Date issued	**Submission Deadline**	**Indicative Weighting**
Week 3 - 26/09/2022	Week 12 – 02/12/2022	30%
Assignment 2 title	Functions, Arrays and Files	

This assessment assesses the following course learning outcomes

# as in Course Guide	**UOWM KDU Penang University College Learning Outcome**
LO3	Implement function and arrays in problem solutions.
LO4	Develop programs that create, read and write files.
# as in Course Guide	**University of Lincoln Learning Outcome**
LO1 LO3	Identify, select, and apply appropriate data structures and operators in common programming solutions Apply object-oriented principles to the implementation of software programs
LO3	Using appropriate knowledge of programming concepts, construct code segments and functions to perform input and output operations with error handling
LO1	understand the time and space efficiency of algorithms and how to calculate/estimate/evaluate and improve them

Student's declaration

I certify that the work submitted for this assignment is my own and research sources are fully acknowledged.

Student's signature:

Submission Date: 02/12/2022

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1.0 Java Source Code

```
package assignment;

import java.io.*; //for file input output
import java.util.Scanner; //scanner class use to scan user's input
import java.util.regex.Pattern; //for ic format pattern

public class assignment2 {
   static Scanner sc = new Scanner (System.in);
   static File file;
   static Scanner input;
   static String fileName = "SampleInput.txt"; //input file name
   public static void main (String[]args)
   {
     try{
       final int size = NoOfRecord(fileName); //get the number of records in the input file
       String[] name = new String[size];
       String[] identityCardNo = new String[size];
       String[] bloodType = new String[size];
       String[] weightStatus = new String[size];
       String[] dob = new String[size];
       String[] gender = new String[size];
       double[] weight = new double[size];
       double[] height = new double[size];
       double[] bmi = new double[size];
       readData(name,identityCardNo,bloodType); //read data from file
       nameValidation(name); //name from file validation
       ICValidation(identityCardNo); //IC from file validation
       bloodTypeValidation(bloodType); //bloodtype from file validation
       keyInHeight (height, name); //key in height and validation
       keyInWeight (weight, name); //key in weight and validation
       extractDOBfromIC(identityCardNo, dob); //extract dob from IC
       extractGenderfromIC(identityCardNo, gender); //extract gender from IC
       calculateBMI(height, weight, bmi); //calculate BMI
       assignWeightStatus(bmi, size, weightStatus); //assign weight status according to BMI
       double heightMean = calculateHeightMean(height); //calculate the height mean for the
group of patients
       double heightSD = calculateHeightSD(height,heightMean); //calculate the height standard
deviation for the group of patients
       double weightMean = calculateWeightMean(weight); //calculate the weight mean for the
group of patients
       double weightSD = calculateWeightSD(weight,weightMean); //calculate the weight
standard deviation for the group of patients
       String highest = findHighestPatient(height, name); //name for highest patients
       String heaviest = findHeaviestPatient(weight, name); //name for heaviest patients
       writeData(size, name, identityCardNo, bloodType, weightStatus, dob, gender,
             height, weight, bmi, heightMean, heightSD, weightMean, weightSD, highest,
heaviest); /*write record of each patient,
       the mean and standard deviation for the group of patients, and name of the highest and the
heaviest patients into a text file*/
```

```
    }
      catch(Exception e){
        //as error message already prompted by other function, so nothing here
    }
  }
    public static int NoOfRecord(String fileName) //get the number of records in the input file
    {
      int lines = 0;
      try (BufferedReader reader = new BufferedReader(new FileReader(fileName)))
      {
          while (reader.readLine() != null)
          {
              lines++;
          }
      }catch (Exception e)
      {
        //as error message already prompted by other function, so nothing here
      }
      return lines;
    }
  public static void readData(String[] name,String[] identityCardNo,String[] bloodType) //read
data from file
  {
      file = new File(fileName);
      int i = 0;
      try{
      //make link
      if (!file.exists())
      {
          System.out.println(fileName+" does not exist.");
      }
      input = new Scanner(file); //load the file into the scanner (input)
      //process data
      while(input.hasNext())
      {
          String line = input.nextLine();
          String[] parts = line.split("#");
          name[i] = parts[0];
          identityCardNo[i] = parts[1];
          bloodType[i] = parts[2];
          i++;
      }
      input.close(); //close link
      }
      //NullPointerException, InputMismatchException, FileNotFoundException
      catch(Exception e){
          System.out.println("Something wrong");
      }
  }
  public static void nameValidation(String[] name) //name from file validation
  {
```

```
        boolean validName=false;
        for(int i=0;i<name.length;i++)
        {
            do
            {
            //validation for name
            if (name[i].isBlank()) //check if the name input is blank
                {
                    System.out.print("Invalid name for Record "+(i+1)+", it should not be blank.\n");
                    validName=false;
                }
            else
                {
                    for (int j=0;j<name[i].length();j++) //checking if the name only contain space and
alphabet
                    {
                        char character = name[i].charAt(j);
                        if (!Character.isLetter(character) && !Character.isWhitespace(character) &&
character!='/')
                            {
                                System.out.print("Invalid name for Record "+(i+1)+", it should not contain
special characters or numbers.\n");
                                validName=false;
                                break;
                            }
                        else
                        {
                            validName=true;
                        }
                    }

                }
            while(!validName) //if its not a valid name, allow the user to key in again
            {
              System.out.print("Please enter the name again for Record "+(i+1)+'.');
              System.out.print("\nName: ");
              name[i]= sc.nextLine();
              break;
            }
            }while(!validName);
        }

    }
    public static void ICValidation(String[] identityCardNo) //IC from file validation
    {
        boolean validIC;
        Pattern p = Pattern.compile("\\d{6}-\\d{2}-\\d{4}"); //patern for ic, xxxxxx-xx-xxxx
        for(int i=0;i<identityCardNo.length;i++)
        {
            do
```

```
            {
            //validation for identityCardNo
            if (!p.matcher(identityCardNo[i]).matches())
            {
              System.out.print("Invalid IC for Record "+(i+1)+", please follow the format 'xxxxxx-xx-
xxxx' and enter the IC again for Record "+(i+1)+'.');
              validIC=false;
            }
            else //validate correct birth date
            {
               int date = Integer.parseInt(identityCardNo[i].substring(4,6));
               int month= Integer.parseInt(identityCardNo[i].substring(2,4));
               if ((date>31 || date<1)||(month<1 || month>12))
               {
                  System.out.print("Invalid IC for Record "+(i+1)+", six leading digits is incorrect,
please enter the IC again for Record "+(i+1)+'.');
                  validIC=false;
               }
               else
               {
                  validIC=true;
               }
            }
            while(!validIC) //if its not a valid IC, allow the user to key in again
            {
              System.out.print("\nIdentity card number: ");
              identityCardNo[i]=sc.nextLine();
              break;
            }
            }while(!validIC);
        }

    }
    public static void bloodTypeValidation(String[] bloodType) //bloodtype from file validation
    {
        boolean validBloodType;
        for(int i=0;i<bloodType.length;i++)
        {
            //validation of blood type
            do
            {
            if(!bloodType[i].equals("A+") && !bloodType[i].equals("A-")&&
               !bloodType[i].equals("B+")&& !bloodType[i].equals("B-")&&
               !bloodType[i].equals("O+")&& !bloodType[i].equals("O-")&&
               !bloodType[i].equals("AB+")&& !bloodType[i].equals("AB-"))
            {
               validBloodType=false;
               System.out.print("Invalid blood type for Record "+(i+1)+"."+"\nPlease enter the blood
type again for record "+(i+1)+'.');
               System.out.print("\nBlood type(A+,A-,B+,B-,O+,O-,AB+,AB-): ");
               bloodType[i]=sc.nextLine(); //if its not a valid blood type, allow the user to key in again
```

```
            }
            else
            {
                validBloodType=true;
            }
            }while(!validBloodType);
        }
    }

    public static void keyInHeight (double[] height, String[] name) //key in height and validation
    {
        boolean validHeight, heightNumeric=true;
        for (int i=0;i<height.length;i++)
        {
           do
           {
            System.out.print("Please enter the height for Patient "+(i+1)+", "+name[i]+".");
            System.out.print("\nHeight(in meter): ");
            String s_height = sc.nextLine();
            try //check if the height input by administrator is number
            {
              height[i] = Double.parseDouble(s_height);  //convert string to numeric type
            }
            catch (NumberFormatException e) //indicate the string is not in numeric format
            {
              heightNumeric=false;
            }
            if(heightNumeric) //validate true height value which should not be negative or zero or
higher than 3m.
            {
                if (height[i]>0 && height[i]<=3)
                {
                    validHeight=true;
                }
                else
                {
                    System.out.print("Invalid height, it should not be negative value or higher than
3m.\nPlease input again.\n");
                    validHeight=false;
                }
            }
            else
            {
                System.out.print("Invalid height, please enter a valid height which is a number.\n");
                validHeight=false;
                heightNumeric=true; //reset heightNumeric to true for try catch
            }
            }while(!validHeight);
        }
    }
    public static void keyInWeight (double[] weight, String[] name) //key in weight and validation
```

```
    {
        boolean validWeight, weightNumeric=true;
        for (int i=0;i<weight.length;i++)
        {
            do
            {
        System.out.print("Please enter the weight for Patient "+(i+1)+", "+name[i]+".");
        System.out.print("\nWeight(in kilogram): ");
        String s_weight = sc.nextLine();
        try //check if the weight input by administrator is number
        {
          weight[i] = Double.parseDouble(s_weight);  //convert string to numeric type
        }
        catch (NumberFormatException e) //indicate the string is not in numeric format
        {
          weightNumeric=false;
        }
        if(weightNumeric)
        {
            if (weight[i]>0 && weight[i]<=640 ) //validate true weight value which should not be
negative or zero or heavier than 640kg.
            {
                validWeight=true;
            }
            else
            {
                System.out.print("Invalid weight, it should not be 0 or lower than 0 or heavier than
640kg.\nPlease input again.\n");
                validWeight=false;
            }
        }
        else
        {
                System.out.print("Invalid weight, please enter a valid height which is a number.\n");
                validWeight=false;
                weightNumeric=true; //reset weightNumeric to true for try catch
        }
        }while(!validWeight);
        }
    }
    public static void extractDOBfromIC(String[] identityCardNo, String[] dob) //extract dob from
IC
    {
        for(int i=0;i<identityCardNo.length;i++)
        {
            dob[i] =identityCardNo[i].substring(4,6)+"/"
                +identityCardNo[i].substring(2,4)+"/"
                +identityCardNo[i].substring(0,2);        //store dob in format of DD/MM/YY
        }
    }
```

```
   public static void extractGenderfromIC(String[] identityCardNo, String[] gender) //extract
gender from IC
   {
      for(int i=0;i<identityCardNo.length;i++)
      {
         if(identityCardNo[i].charAt(11)%2!=0)      //last digit even number is female, odd number
is male
      {
        gender[i] = "Male";
      }
      else
      {
         gender[i] = "Female";
      }
      }
   }
   public static void calculateBMI(double[] height, double[] weight,double[] bmi) //calculate BMI
   {
      for(int i=0;i<height.length;i++)
      {
         bmi[i]=weight[i]/(Math.pow(height[i],2));         //calculate bmi value
      }
   }
   public static void assignWeightStatus(double[] bmi,int f, String[] weightStatus) //assign weight
status according to BMI
   {
      for(int i=0;i<f;i++)
      {
         if(bmi[i]>=30)     //assigning weight status
      {
         weightStatus[i]="Obese";
      }
      else if(bmi[i]<30 && bmi[i]>=25)
      {
         weightStatus[i]="Overweight";
      }
      else if(bmi[i]<25 && bmi[i]>=18.5)
      {
         weightStatus[i]="Healthy Weight";
      }
      else
      {
          weightStatus[i]="Underweight";
      }
      }
   }
   public static double calculateHeightMean(double[] height) //calculate the height mean for the
group of patients
   {
      double sum=0.0;
      for (double h : height)
```

```
        {
            sum+=h;
        }
        return sum/height.length;
    }
    public static double calculateHeightSD(double[] height, double heightMean) //calculate the
height standard deviation for the group of patients
    {
        double sum=0.0;
        for (double h : height)
        {
            sum+=Math.pow(h - heightMean, 2);
        }
        return Math.sqrt(sum/height.length);
    }
    public static double calculateWeightMean(double[] weight) //calculate the weight mean for the
group of patients
    {
        double sum=0.0;
        for (double w : weight)
        {
            sum+=w;
        }
        return sum/weight.length;
    }
    public static double calculateWeightSD(double[] weight, double weightMean) //calculate the
weight standard deviation for the group of patients
    {
        double sum=0.0;
        for (double w : weight)
        {
            sum+=Math.pow(w - weightMean, 2);
        }
        return Math.sqrt(sum/weight.length);
    }
    public static String findHighestPatient (double[] height, String[] name) //name for highest
patients
    {
        double highest = height[0];
        String patients="";
        for (int i=0;i<height.length;i++) //comparing highest height
        {
            if(height[i]>highest)
            {
                highest=height[i];
            }
        }
        for (int j=0;j<height.length;j++)
        {
            if (height[j]==highest)
            {
```

```
                patients+=name[j]+", "; //add together all highest patients
            }
        }
      return patients;
    }
    public static String findHeaviestPatient (double[] weight, String[] name) //name for heaviest
patients
    {
        double heaviest = weight[0];
        String patients="";
        for (int i=0;i<weight.length;i++)  //comparing heaviest weight
        {
            if(weight[i]>heaviest)
            {
                heaviest=weight[i];
            }
        }
        for (int j=0;j<weight.length;j++)
        {
            if (weight[j]==heaviest)
            {
                patients+=name[j]+", "; //add together all heaviest patients
            }
        }
      return patients;
    }
    public static void writeData(int size,String[] name, String[] identityCardNo, String[] bloodType,
            String[] weightStatus, String[] dob, String[] gender, double[] height, double[] weight,
double[] bmi,
            double heightMean, double heightSD, double weightMean, double weightSD, String
highestP, String heaviestP)
            /*write record of each patient,
        the mean and standard deviation for the group of patients, and name of the highest and the
heaviest patients into a text file*/
    {
        try
        {
        PrintWriter output;
        output = new PrintWriter("patientRecord.txt"); //output file name
        for(int j=0;j<size;j++)
        {
        //write patient's information
        output.println("\t\t\tRecord "+(j+1));
        output.println("=========================================================");
        output.println("Name: \t\t\t      "+name[j]);
        output.println("Identity card number:          "+identityCardNo[j]);
        output.printf("Height: \t\t      %.2f m",height[j]);
        output.printf("\nWeight: \t\t      %.1f kg",weight[j]);
        output.println("\nBlood type: \t\t      "+bloodType[j]);
        output.println("Date of birth[DD/MM/YY]: "+dob[j]);
        output.println("Gender: \t\t      "+gender[j]);
```

```
        output.printf("BMI: \t\t\t      %.1f",bmi[j]);
        output.println("\nWeight status: \t\t      "+weightStatus[j]);

output.println("=========================================================\n");
        }
        //write rhe mean and standard deviation for the group of patients, name of the highest and
the heaviest patients
        output.printf("\nMean of height: \t\t%.4f",heightMean);
        output.printf("\nStandard deviation of height: \t%.4f",heightSD);
        output.printf("\nMean of weight: \t\t%.4f",weightMean);
        output.printf("\nStandard deviation of weight: \t%.4f",weightSD);
        output.println("\nName of the highest patients: \t"+highestP.substring(0,(highestP.length()-
2))); //-2 to delete ", "
        output.println("Name of the heaviest patients: "+heaviestP.substring(0,(heaviestP.length()-
2))); // -2 to delete ", "
        output.close();//close link
    }

    catch (Exception e)
    {
        //NullPointerException, InputMismatchException, FileNotFoundException
        System.out.println("Something wrong");
    }
}
}
```

2.0 Description

This program is built to enable user to load patient's name, identification number and blood type from a text file and key in each patient's height and weight. Eventually, the program will write the record of each patient (name, identity card number, height, weight, blood type, date of birth, gender, BMI, and weight status), the mean and standard deviation of height and weight for the group of patients, and the name of the highest and the heaviest patients into a text file.

```java
import java.io.*; //for file input output
import java.util.Scanner; //scanner class use to scan user's input
import java.util.regex.Pattern; //for ic format pattern

/**
 *
 * @author Akatsuki
 */
public class assignment2 {
    static Scanner sc = new Scanner ( source: System.in);
    static File file;
    static Scanner input;
    static String fileName = "SampleInput.txt"; //input file name
    public static void main (String[]args)
    {
        final int size = NoOfRecord(fileName); //get the number of records in the input file
        String[] name = new String[size];
        String[] identityCardNo = new String[size];
        String[] bloodType = new String[size];
        String[] weightStatus = new String[size];
        String[] dob = new String[size];
        String[] gender = new String[size];
        double[] weight = new double[size];
        double[] height = new double[size];
```

Figure 1.0 Modify input file name

```java
    {
        try
        {
        PrintWriter output;
        output = new PrintWriter( fileName: "patientRecord.txt"); //output file name
        for(int j=0;j<size;j++)
        {
        //write patient's information
        output.println("\t\t\tRecord "+(j+1));
        output.println( x: "=====================================================");
        output.println("Name: \t\t\t      "+name[j]);
        output.println("Identity card number:          "+identityCardNo[j]);
        output.printf( format: "Height: \t\t      %.2f m",height[j]);
        output.printf( format: "\nWeight: \t\t      %.1f kg",weight[j]);
        output.println("\nBlood type: \t\t      "+bloodType[j]);
        output.println("Date of birth[DD/MM/YY]: "+dob[j]);
        output.println("Gender: \t\t      "+gender[j]);
        output.printf( format: "BMI: \t\t\t      %.1f",bmi[j]);
        output.println("\nWeight status: \t\t      "+weightStatus[j]);
        output.println( x: "=====================================================\n");
        }
```

Figure 1.1 Modify output file name

The name for the input file to load patient's information and the name for the output file to write patient's records can be modify by the user as shown in *Figure 1.0* and *Figure 1.1*.

2.1 Demonstration using SampleInput.txt

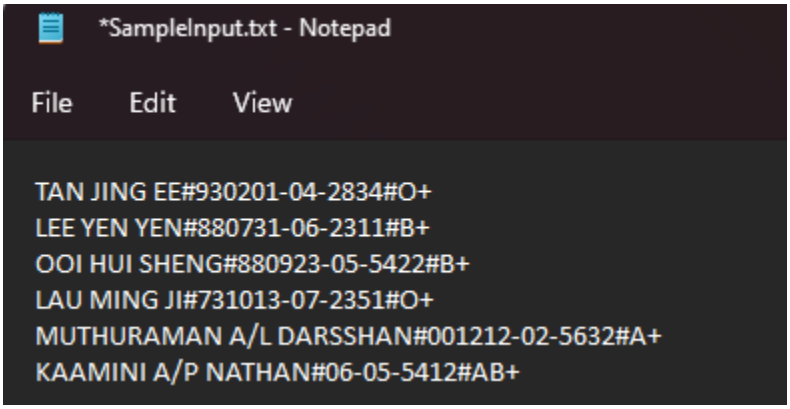


Figure 2.0 SampleInput.txt

SampleInput.txt provided as shown in *Figure 2.0* will be used to demonstrate the program.

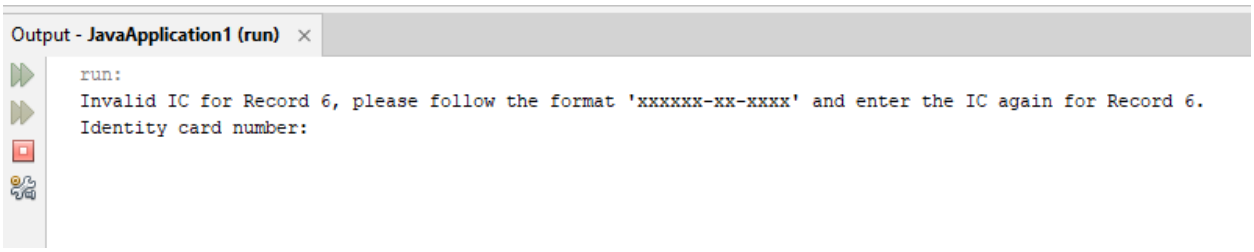


Figure 2.1 Prompting invalid IC message for Record 6

After running the program, it first prompted that the IC for Record 6 is invalid. This is due to the reason that, the identity card number for record 6 is 06-05-5412 which does not follow the correct IC format, XXXXXX-XX-XXXX. Therefore, the program ask the user to key in the correct IC for Record 6 as shown in *Figure 2.1*.

```
Output - JavaApplication1 (run)
run:
Invalid IC for Record 6, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 6.
Identity card number: 680706-05-5412
Please enter the height for Patient 1, TAN JING EE.
Height(in meter):
```

```
Output - JavaApplication1 (run)
run:
Invalid IC for Record 6, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 6.
Identity card number: 680706-05-5412
Please enter the height for Patient 1, TAN JING EE.
Height(in meter): 1.57
Please enter the height for Patient 2, LEE YEN YEN.
Height(in meter):
```

```
Output - JavaApplication1 (run)
Identity card number: 680706-05-5412
Please enter the height for Patient 1, TAN JING EE.
Height(in meter): 1.57
Please enter the height for Patient 2, LEE YEN YEN.
Height(in meter): 1.62
Please enter the height for Patient 3, OOI HUI SHENG.
Height(in meter): 1.77
Please enter the height for Patient 4, LAU MING JI.
Height(in meter): 1.80
Please enter the height for Patient 5, MUTHURAMAN A/L DARSSHAN.
Height(in meter): 1.80
Please enter the height for Patient 6, KAAMINI A/P NATHAN.
Height(in meter): 1.59
```

Figure 2.2, *Figure 2.3*, *Figure 2.4* Prompting for patient's height

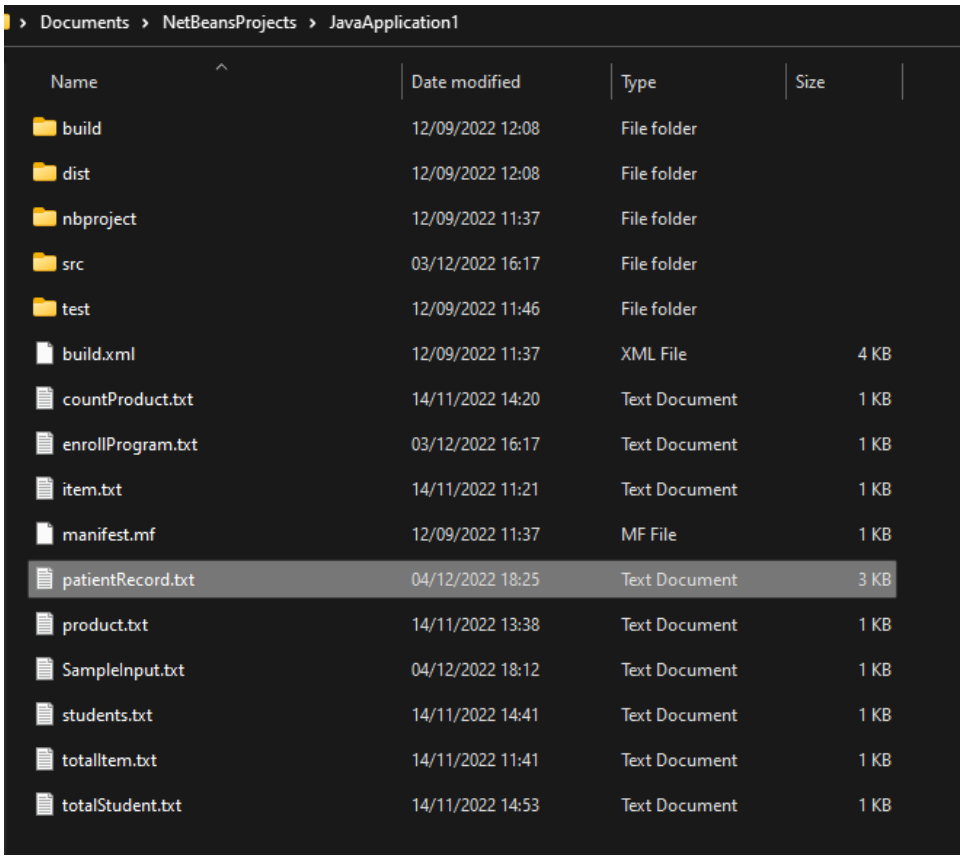
After the user key in the correct format of IC for Record 6, the program continues to prompt user to key in the height for each patient as shown in *Figure 2.2*, *Figure 2.3*, *Figure 2.4*.

```
Output - JavaApplication1 (run)
Identity card number: 680706-05-5412
Please enter the height for Patient 1, TAN JING EE.
Height(in meter): 1.57
Please enter the height for Patient 2, LEE YEN YEN.
Height(in meter): 1.62
Please enter the height for Patient 3, OOI HUI SHENG.
Height(in meter): 1.77
Please enter the height for Patient 4, LAU MING JI.
Height(in meter): 1.80
Please enter the height for Patient 5, MUTHURAMAN A/L DARSSHAN.
Height(in meter): 1.80
Please enter the height for Patient 6, KAAMINI A/P NATHAN.
Height(in meter): 1.59
Please enter the weight for Patient 1, TAN JING EE.
Weight(in kilogram):
```

```
Output - JavaApplication1 (run)
Height(in meter): 1.59
Please enter the weight for Patient 1, TAN JING EE.
Weight(in kilogram): 55
Please enter the weight for Patient 2, LEE YEN YEN.
Weight(in kilogram): 47
Please enter the weight for Patient 3, OOI HUI SHENG.
Weight(in kilogram): 58
Please enter the weight for Patient 4, LAU MING JI.
Weight(in kilogram): 60
Please enter the weight for Patient 5, MUTHURAMAN A/L DARSSHAN.
Weight(in kilogram): 98
Please enter the weight for Patient 6, KAAMINI A/P NATHAN.
Weight(in kilogram): 98
BUILD SUCCESSFUL (total time: 8 minutes 8 seconds)
```

Figure 2.5, *Figure 2.6* Prompting for patient's weight

After the user key in valid height for each patient, the program continues to prompt user to key in the weight for each patient as shown in *Figure 2.5*, *Figure 2.6*. Then, the program will eventually end after the user key in valid weight for each patient.



Documents › NetBeansProjects › JavaApplication1

Name	Date modified	Type	Size
build	12/09/2022 12:08	File folder	
dist	12/09/2022 12:08	File folder	
nbproject	12/09/2022 11:37	File folder	
src	03/12/2022 16:17	File folder	
test	12/09/2022 11:46	File folder	
build.xml	12/09/2022 11:37	XML File	4 KB
countProduct.txt	14/11/2022 14:20	Text Document	1 KB
enrollProgram.txt	03/12/2022 16:17	Text Document	1 KB
item.txt	14/11/2022 11:21	Text Document	1 KB
manifest.mf	12/09/2022 11:37	MF File	1 KB
patientRecord.txt	04/12/2022 18:25	Text Document	3 KB
product.txt	14/11/2022 13:38	Text Document	1 KB
SampleInput.txt	04/12/2022 18:12	Text Document	1 KB
students.txt	14/11/2022 14:41	Text Document	1 KB
totalItem.txt	14/11/2022 11:41	Text Document	1 KB
totalStudent.txt	14/11/2022 14:53	Text Document	1 KB

Figure 2.7 patientRecord.txt file in JavaApplication1 folder

Next, proceed to the JavaApplication1 folder, patientRecord.txt created can be found as shown in *Figure 2.7*.

patientRecord.txt - Notepad

File Edit View

```
                    Record 1
=========================================================
Name:                       TAN JING EE
Identity card number:       930201-04-2834
Height:                     1.57 m
Weight:                     55.0 kg
Blood type:                 O+
Date of birth[DD/MM/YY]: 01/02/93
Gender:                     Female
BMI:                        22.3
Weight status:              Healthy Weight
=========================================================

                    Record 2
=========================================================
Name:                       LEE YEN YEN
Identity card number:       880731-06-2311
Height:                     1.62 m
Weight:                     47.0 kg
Blood type:                 B+
Date of birth[DD/MM/YY]: 31/07/88
Gender:                     Male
BMI:                        17.9
Weight status:              Underweight
=========================================================

                    Record 3
=========================================================
Name:                       OOI HUI SHENG
Identity card number:       880923-05-5422
Height:                     1.77 m
Weight:                     58.0 kg
Blood type:                 B+
Date of birth[DD/MM/YY]: 23/09/88
Gender:                     Female
BMI:                        18.5
Weight status:              Healthy Weight
=========================================================

                    Record 4
=========================================================
Name:                       LAU MING JI
Identity card number:       731013-07-2351
Height:                     1.80 m
```

patientRecord.txt - Notepad

File Edit View

```
Name:                    LAU MING JI
Identity card number:    731013-07-2351
Height:                  1.80 m
Weight:                  60.0 kg
Blood type:              O+
Date of birth[DD/MM/YY]: 13/10/73
Gender:                  Male
BMI:                     18.5
Weight status:           Healthy Weight
=======================================================

                    Record 5
=======================================================
Name:                    MUTHURAMAN A/L DARSSHAN
Identity card number:    001212-02-5632
Height:                  1.80 m
Weight:                  98.0 kg
Blood type:              A+
Date of birth[DD/MM/YY]: 12/12/00
Gender:                  Female
BMI:                     30.2
Weight status:           Obese
=======================================================

                    Record 6
=======================================================
Name:                    KAAMINI A/P NATHAN
Identity card number:    680706-05-5412
Height:                  1.59 m
Weight:                  98.0 kg
Blood type:              AB+
Date of birth[DD/MM/YY]: 06/07/68
Gender:                  Female
BMI:                     38.8
Weight status:           Obese
=======================================================


Mean of height:                1.6917
Standard deviation of height:  0.0999
Mean of weight:                69.3333
Standard deviation of weight:  20.6694
Name of the highest patients:  LAU MING JI, MUTHURAMAN A/L DARSSHAN
Name of the heaviest patients: MUTHURAMAN A/L DARSSHAN, KAAMINI A/P NATHAN
```

Ln 1, Col 1

Figure 2.8, *Figure 2.9* patientRecord.txt file

After open the file, the record of each patient (name, identity card number, height, weight, blood type, date of birth, gender, BMI, and weight status), the mean and standard deviation of height and weight for the group of patients, and the name of the highest and the heaviest patients are written in the file as shown in *Figure 2.8*, *Figure 2.9*.

2.2 Demonstration of validation system in the program

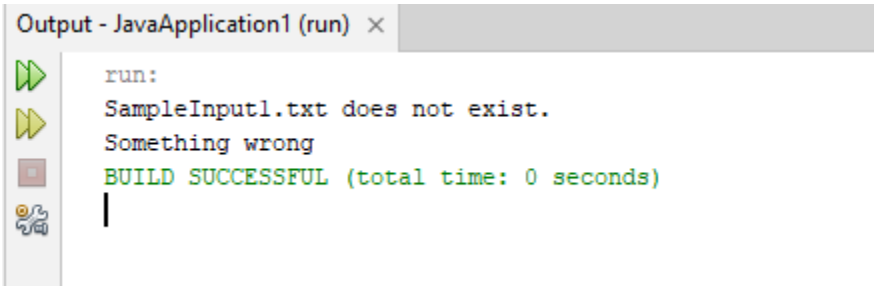


Figure 3.0 Input file does not exist

If the input file does not exist, the program will prompt error message as shown in *Figure 3.0*.

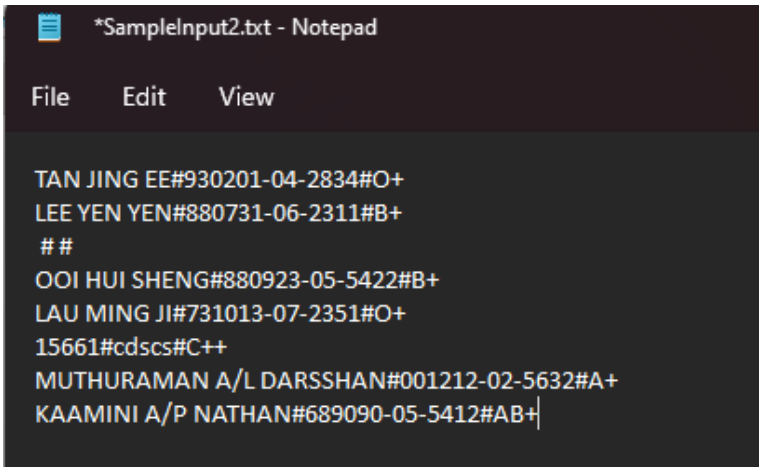


Figure 3.1 SampleInput2.txt

In order to demonstrate the name validation, identity card number validation and blood type validation, SampleInput2.txt as shown in *Figure 3.1* is used.

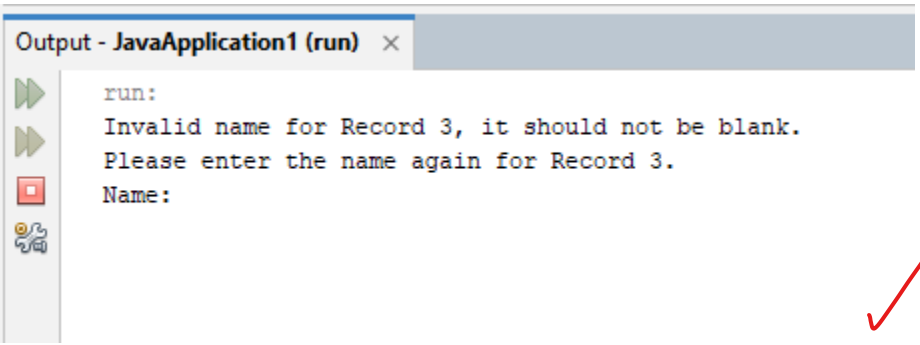


Figure 3.2 Prompt invalid name for Record 3

After running the program, due to the reason that the name for Record 3 is blank, the program prompted the user to key in a valid name for Record 3 as shown in *Figure 3.2*.

```
Output - JavaApplication1 (run)
run:
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: 151561
Invalid name for Record 3, it should not contain special characters or numbers.
Please enter the name again for Record 3.
Name:
```

Figure 3.3 Invalid name – contain numbers

```
Output - JavaApplication1 (run)
run:
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: 151561
Invalid name for Record 3, it should not contain special characters or numbers.
Please enter the name again for Record 3.
Name:
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name:
```

Figure 3.4 Invalid name – blank

```
Output - JavaApplication1 (run)
run:
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: 151561
Invalid name for Record 3, it should not contain special characters or numbers.
Please enter the name again for Record 3.
Name:
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: Amin!
Invalid name for Record 3, it should not contain special characters or numbers.
Please enter the name again for Record 3.
Name:
```

Figure 3.5 Invalid name – contain special characters ('/' is excluded)

The program will validate name input by the user, if the name input is blank or contains numbers or special characters, the program will prompt error message and allow the user to repeat the input for patient's name until the input is a valid name as shown in *Figure 3.3*, *Figure 3.4*, *Figure 3.5*.

```
Output - JavaApplication1 (run)
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: 151561
Invalid name for Record 3, it should not contain special characters or numbers.
Please enter the name again for Record 3.
Name:
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: Amin!
Invalid name for Record 3, it should not contain special characters or numbers.
Please enter the name again for Record 3.
Name: Kumar a/l Anbil Shankar
Invalid name for Record 6, it should not contain special characters or numbers.
Please enter the name again for Record 6.
Name:
```

Figure 3.6 Prompt invalid name for Record 6

After entered a valid name for Record 3, the program will continue to prompt for the next invalid name, which is in Record 6, as the patient's name in Record 6 is "15661", which is not a valid name. (*Figure 3.6*)

```
Output - JavaApplication1 (run)
Name: 151561
Invalid name for Record 3, it should not contain special characters or numbers.
Please enter the name again for Record 3.
Name:
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: Amin!
Invalid name for Record 3, it should not contain special characters or numbers.
Please enter the name again for Record 3.
Name: Kumar a/l Anbil Shankar
Invalid name for Record 6, it should not contain special characters or numbers.
Please enter the name again for Record 6.
Name: LIM JIA SHENG
Invalid IC for Record 3, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 3.
Identity card number:
```

Figure 3.7 Prompt invalid identity card number for Record 3

After entered a valid name for Record 6, due to the reason that the identity card number for Record 3 is blank, the program prompted the user to key in a valid identity card number for Record 3 as shown in *Figure 3.7*.

```
Output - JavaApplication1 (run)
Please enter the name again for Record 3.
Name:
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: Amin!
Invalid name for Record 3, it should not contain special characters or numbers.
Please enter the name again for Record 3.
Name: Kumar a/l Anbil Shankar
Invalid name for Record 6, it should not contain special characters or numbers.
Please enter the name again for Record 6.
Name: LIM JIA SHENG
Invalid IC for Record 3, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 3.
Identity card number:
Invalid IC for Record 3, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 3.
Identity card number:
```

Figure 4.0 Invalid identity card number – blank

```
Output - JavaApplication1 (run)
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: Amin!
Invalid name for Record 3, it should not contain special characters or numbers.
Please enter the name again for Record 3.
Name: Kumar a/l Anbil Shankar
Invalid name for Record 6, it should not contain special characters or numbers.
Please enter the name again for Record 6.
Name: LIM JIA SHENG
Invalid IC for Record 3, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 3.
Identity card number:
Invalid IC for Record 3, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 3.
Identity card number: 102110201021
Invalid IC for Record 3, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 3.
Identity card number:
```

Figure 4.1 Invalid identity card number – does not follow format “XXXXXX-XX-XXXX”

```
Output - JavaApplication1 (run)
run:
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: Kumar a/l Anbil Shankar
Invalid name for Record 6, it should not contain special characters or numbers.
Please enter the name again for Record 6.
Name: LIM JIA SHENG
Invalid IC for Record 3, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 3.
Identity card number: 699999-07-0236
Invalid IC for Record 3, six leading digits is incorrect, please enter the IC again for Record 3.
Identity card number:
```

Figure 4.2 Invalid identity card number – incorrect birth date and month (six leading digits)

The program will validate identity card number input by the user, if the identity card number input is blank or does not follow format “XXXXXX-XX-XXXX” or contains incorrect birth date and month (six leading digits) the program will prompt error message and allow the user to repeat the input for patient’s identity card number until the input is a valid identity card number as shown in *Figure 4.0*, *Figure 4.1*, *Figure 4.2*.

```
Output - JavaApplication1 (run)
run:
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: Kumar a/l Anbil Shankar
Invalid name for Record 6, it should not contain special characters or numbers.
Please enter the name again for Record 6.
Name: LIM JIA SHENG
Invalid IC for Record 3, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 3.
Identity card number: 699999-07-0236
Invalid IC for Record 3, six leading digits is incorrect, please enter the IC again for Record 3.
Identity card number: 770528-07-0421
Invalid IC for Record 6, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 6.
Identity card number:
```

Figure 4.3 Prompt invalid identity card number for Record 6

After entered a valid identity card number for Record 3, due to the reason that the identity card number for Record 6 is “cdscs”, which is not a valid identity card number, the program prompted the user to key in a valid identity card number for Record 6 as shown in *Figure 4.3*.

```
Output - JavaApplication1 (run)
run:
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: Kumar a/l Anbil Shankar
Invalid name for Record 6, it should not contain special characters or numbers.
Please enter the name again for Record 6.
Name: LIM JIA SHENG
Invalid IC for Record 3, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 3.
Identity card number: 770528-07-0421
Invalid IC for Record 6, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 6.
Identity card number: 680821-05-0668
Invalid IC for Record 8, six leading digits is incorrect, please enter the IC again for Record 8.
Identity card number:
```

Figure 4.4 Prompt invalid identity card number for Record 8

After entered a valid identity card number for Record 6, due to the reason that the identity card number for Record 8 is “689090-05-5412”, which is not a valid identity card number, the program prompted the user to key in a valid identity card number for Record 8 as shown in *Figure 4.4*.

```
Output - JavaApplication1 (run)
Invalid name for Record 3, it should not be blank.
Please enter the name again for Record 3.
Name: Kumar a/l Anbil Shankar
Invalid name for Record 6, it should not contain special characters or numbers.
Please enter the name again for Record 6.
Name: LIM JIA SHENG
Invalid IC for Record 3, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 3.
Identity card number: 770528-07-0421
Invalid IC for Record 6, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 6.
Identity card number: 680821-05-0668
Invalid IC for Record 8, six leading digits is incorrect, please enter the IC again for Record 8.
Identity card number: 680808-05-5412
Invalid blood type for Record 3.
Please enter the blood type again for record 3.
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-):
```

Figure 4.5 Prompt invalid blood type for Record 3

After entered a valid identity card number for Record 8, due to the reason that the blood type for Record 3 is blank, the program prompted the user to key in a valid blood type for Record 3 as shown in *Figure 4.5*.

```
Output - JavaApplication1 (run)
Invalid name for Record 6, it should not contain special characters or numbers.
Please enter the name again for Record 6.
Name: LIM JIA SHENG
Invalid IC for Record 3, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 3.
Identity card number: 770528-07-0421
Invalid IC for Record 6, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 6.
Identity card number: 680821-05-0668
Invalid IC for Record 8, six leading digits is incorrect, please enter the IC again for Record 8.
Identity card number: 680808-05-5412
Invalid blood type for Record 3.
Please enter the blood type again for record 3.
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): S+
Invalid blood type for Record 3.
Please enter the blood type again for record 3.
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): |
```

Figure 4.6 Invalid blood type – not in given list

The program will validate the patient's blood type input by the user which should be in the given list (A+,A-,B+,B-,O+,O-,AB+,AB-). The program will prompt error message and allow the user to repeat the input for patient's blood type for every invalid input. (*Figure 4.6)*

```
Output - JavaApplication1 (run)
Invalid IC for Record 3, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 3.
Identity card number: 770528-07-0421
Invalid IC for Record 6, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 6.
Identity card number: 680821-05-0668
Invalid IC for Record 8, six leading digits is incorrect, please enter the IC again for Record 8.
Identity card number: 680808-05-5412
Invalid blood type for Record 3.
Please enter the blood type again for record 3.
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): S+
Invalid blood type for Record 3.
Please enter the blood type again for record 3.
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): B+
Invalid blood type for Record 6.
Please enter the blood type again for record 6.
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): |
```

Figure 4.7 Prompt invalid blood type for Record 6

After entered a valid blood type for Record 3, due to the reason that the blood type for Record 6 is "C++", which is not a valid blood type, the program prompted the user to key in a valid blood type for Record 6 as shown in *Figure 4.7*.

```
Output - JavaApplication1 (run)
Invalid IC for Record 6, please follow the format 'xxxxxx-xx-xxxx' and enter the IC again for Record 6.
Identity card number: 680821-05-0668
Invalid IC for Record 8, six leading digits is incorrect, please enter the IC again for Record 8.
Identity card number: 680808-05-5412
Invalid blood type for Record 3.
Please enter the blood type again for record 3.
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): S+
Invalid blood type for Record 3.
Please enter the blood type again for record 3.
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): B+
Invalid blood type for Record 6.
Please enter the blood type again for record 6.
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): AB+
Please enter the height for Patient 1, TAN JING EE.
Height(in meter):
```

```
Output - JavaApplication1 (run)
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): S+
Invalid blood type for Record 3.
Please enter the blood type again for record 3.
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): B+
Invalid blood type for Record 6.
Please enter the blood type again for record 6.
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): AB+
Please enter the height for Patient 1, TAN JING EE.
Height(in meter): 1.59
Please enter the height for Patient 2, LEE YEN YEN.
Height(in meter): 1.67
Please enter the height for Patient 3, Kumar a/l Anbil Shankar.
Height(in meter): 1.85
Please enter the height for Patient 4, OOI HUI SHENG.
Height(in meter):
```

Figure 4.8, *Figure 4.9* Prompting for patient's height

After entered a valid blood type for Record 6, the program will prompt for patient's height for each patient as shown in *Figure 4.8*, *Figure 4.9*.

```
Output - JavaApplication1 (run)
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): B+
Invalid blood type for Record 6.
Please enter the blood type again for record 6.
Blood type(A+,A-,B+,B-,O+,O-,AB+,AB-): AB+
Please enter the height for Patient 1, TAN JING EE.
Height(in meter): 1.59
Please enter the height for Patient 2, LEE YEN YEN.
Height(in meter): 1.67
Please enter the height for Patient 3, Kumar a/l Anbil Shankar.
Height(in meter): 1.85
Please enter the height for Patient 4, OOI HUI SHENG.
Height(in meter): fsfdsf
Invalid height, please enter a valid height which is a number.
Please enter the height for Patient 4, OOI HUI SHENG.
Height(in meter):
```

Figure 5.0 Invalid height – contain non-numeric character

```
Output - JavaApplication1 (run)
Please enter the height for Patient 3, Kumar a/l Anbil Shankar.
Height(in meter): 1.85
Please enter the height for Patient 4, OOI HUI SHENG.
Height(in meter): fsfdsf
Invalid height, please enter a valid height which is a number.
Please enter the height for Patient 4, OOI HUI SHENG.
Height(in meter): -5
Invalid height, it should not be negative value or higher than 3m.
Please input again.
Please enter the height for Patient 4, OOI HUI SHENG.
Height(in meter): 60
Invalid height, it should not be negative value or higher than 3m.
Please input again.
Please enter the height for Patient 4, OOI HUI SHENG.
Height(in meter):
```

Figure 5.1 Invalid height – not within normal range (0m<x<= 3m)

The program will validate the patient's height input by the user which should be numeric and within normal height range (0m<x<= 3m). The program will prompt error message and allow the user to repeat the input for patient's height for every invalid input. (*Figure 5.0, Figure 5.1*)

```
Output - JavaApplication1 (run)
Height(in meter): 60
Invalid height, it should not be negative value or higher than 3m.
Please input again.
Please enter the height for Patient 4, OOI HUI SHENG.
Height(in meter): 1.85
Please enter the height for Patient 5, LAU MING JI.
Height(in meter): 1.77
Please enter the height for Patient 6, LIM JIA SHENG.
Height(in meter): 1.85
Please enter the height for Patient 7, MUTHURAMAN A/L DARSSHAN.
Height(in meter): 1.76
Please enter the height for Patient 8, KAAMINI A/P NATHAN.
Height(in meter): 1.48
Please enter the weight for Patient 1, TAN JING EE.
Weight(in kilogram):
```

```
Output - JavaApplication1 (run)
Height(in meter): 1.85
Please enter the height for Patient 5, LAU MING JI.
Height(in meter): 1.77
Please enter the height for Patient 6, LIM JIA SHENG.
Height(in meter): 1.85
Please enter the height for Patient 7, MUTHURAMAN A/L DARSSHAN.
Height(in meter): 1.76
Please enter the height for Patient 8, KAAMINI A/P NATHAN.
Height(in meter): 1.48
Please enter the weight for Patient 1, TAN JING EE.
Weight(in kilogram): 56
Please enter the weight for Patient 2, LEE YEN YEN.
Weight(in kilogram): 77
Please enter the weight for Patient 3, Kumar a/l Anbil Shankar.
Weight(in kilogram):
```

Figure 5.2, *Figure 5.3* Prompting for patient's weight

After entered a valid height for each patient, the program will prompt for patient's weight for each patient as shown in *Figure 5.2*, *Figure 5.3*.

```
Output - JavaApplication1 (run)
Please enter the height for Patient 7, MUTHURAMAN A/L DARSSHAN.
Height(in meter): 1.76
Please enter the height for Patient 8, KAAMINI A/P NATHAN.
Height(in meter): 1.48
Please enter the weight for Patient 1, TAN JING EE.
Weight(in kilogram): 56
Please enter the weight for Patient 2, LEE YEN YEN.
Weight(in kilogram): 77
Please enter the weight for Patient 3, Kumar a/l Anbil Shankar.
Weight(in kilogram): dasda
Invalid weight, please enter a valid height which is a number.
Please enter the weight for Patient 3, Kumar a/l Anbil Shankar.
Weight(in kilogram): 9
Please enter the weight for Patient 4, OOI HUI SHENG.
Weight(in kilogram):
```

Figure 5.4 Invalid weight – contain non-numeric character

```
Output - JavaApplication1 (run)
Please enter the weight for Patient 1, TAN JING EE.
Weight(in kilogram): 56
Please enter the weight for Patient 2, LEE YEN YEN.
Weight(in kilogram): 77
Please enter the weight for Patient 3, Kumar a/l Anbil Shankar.
Weight(in kilogram): dasda
Invalid weight, please enter a valid height which is a number.
Please enter the weight for Patient 3, Kumar a/l Anbil Shankar.
Weight(in kilogram): 9
Please enter the weight for Patient 4, OOI HUI SHENG.
Weight(in kilogram): 1000
Invalid weight, it should not be 0 or lower than 0 or heavier than 640kg.
Please input again.
Please enter the weight for Patient 4, OOI HUI SHENG.
Weight(in kilogram):
```

Figure 5.5 Invalid weight – not within normal range (0kg<x<= 640kg)

The program will validate the patient's weight input by the user which should be numeric and within normal weight range (0kg<x<=640kg). The program will prompt error message and allow the user to repeat the input for patient's weight for every invalid input. (*Figure 5.4, Figure 5.5*)

```
Output - JavaApplication1 (run)
Weight(in kilogram): 1000
Invalid weight, it should not be 0 or lower than 0 or heavier than 640kg.
Please input again.
Please enter the weight for Patient 4, OOI HUI SHENG.
Weight(in kilogram): 85
Please enter the weight for Patient 5, LAU MING JI.
Weight(in kilogram): 100
Please enter the weight for Patient 6, LIM JIA SHENG.
Weight(in kilogram): 86
Please enter the weight for Patient 7, MUTHURAMAN A/L DARSSHAN.
Weight(in kilogram): 100
Please enter the weight for Patient 8, KAAMINI A/P NATHAN.
Weight(in kilogram): 66
BUILD SUCCESSFUL (total time: 23 minutes 17 seconds)
```

Figure 5.6 End of the program

After the user key in valid weight for each patient, the program will eventually end as shown in *Figure 5.6*.

patientRecord.txt - Notepad

File Edit View

```
                    Record 1
=========================================================
Name:                       TAN JING EE
Identity card number:       930201-04-2834
Height:                     1.59 m
Weight:                     56.0 kg
Blood type:                 O+
Date of birth[DD/MM/YY]: 01/02/93
Gender:                     Female
BMI:                        22.2
Weight status:              Healthy Weight
=========================================================

                    Record 2
=========================================================
Name:                       LEE YEN YEN
Identity card number:       880731-06-2311
Height:                     1.67 m
Weight:                     77.0 kg
Blood type:                 B+
Date of birth[DD/MM/YY]: 31/07/88
Gender:                     Male
BMI:                        27.6
Weight status:              Overweight
=========================================================

                    Record 3
=========================================================
Name:                       Kumar a/l Anbil Shankar
Identity card number:       770528-07-0421
Height:                     1.85 m
Weight:                     9.0 kg
Blood type:                 B+
Date of birth[DD/MM/YY]: 28/05/77
Gender:                     Female
BMI:                        2.6
Weight status:              Underweight
=========================================================

                    Record 4
=========================================================
Name:                       OOI HUI SHENG
Identity card number:       880923-05-5422
Height:                     1.85 m
```

Ln 1, Col 1

patientRecord.txt - Notepad

File Edit View

```
                    Record 4
=========================================================
Name:                       OOI HUI SHENG
Identity card number:       880923-05-5422
Height:                     1.85 m
Weight:                     85.0 kg
Blood type:                 B+
Date of birth[DD/MM/YY]: 23/09/88
Gender:                     Female
BMI:                        24.8
Weight status:              Healthy Weight
=========================================================

                    Record 5
=========================================================
Name:                       LAU MING JI
Identity card number:       731013-07-2351
Height:                     1.77 m
Weight:                     100.0 kg
Blood type:                 O+
Date of birth[DD/MM/YY]: 13/10/73
Gender:                     Male
BMI:                        31.9
Weight status:              Obese
=========================================================

                    Record 6
=========================================================
Name:                       LIM JIA SHENG
Identity card number:       680821-05-0668
Height:                     1.85 m
Weight:                     86.0 kg
Blood type:                 AB+
Date of birth[DD/MM/YY]: 21/08/68
Gender:                     Female
BMI:                        25.1
Weight status:              Overweight
=========================================================

                    Record 7
=========================================================
Name:                       MUTHURAMAN A/L DARSSHAN
Identity card number:       001212-02-5632
Height:                     1.76 m
Weight:                     100.0 kg
```

Ln 1, Col 1

```
patientRecord.txt - Notepad

File    Edit    View

Name:                       LIM JIA SHENG
Identity card number:       680821-05-0668
Height:                     1.85 m
Weight:                     86.0 kg
Blood type:                 AB+
Date of birth[DD/MM/YY]:    21/08/68
Gender:                     Female
BMI:                        25.1
Weight status:              Overweight
=========================================================

                        Record 7
=========================================================
Name:                       MUTHURAMAN A/L DARSSHAN
Identity card number:       001212-02-5632
Height:                     1.76 m
Weight:                     100.0 kg
Blood type:                 A+
Date of birth[DD/MM/YY]:    12/12/00
Gender:                     Female
BMI:                        32.3
Weight status:              Obese
=========================================================

                        Record 8
=========================================================
Name:                       KAAMINI A/P NATHAN
Identity card number:       680808-05-5412
Height:                     1.48 m
Weight:                     66.0 kg
Blood type:                 AB+
Date of birth[DD/MM/YY]:    08/08/68
Gender:                     Female
BMI:                        30.1
Weight status:              Obese
=========================================================


Mean of height:                 1.7275
Standard deviation of height:   0.1281
Mean of weight:                 72.3750
Standard deviation of weight:   27.8789
Name of the highest patients:   Kumar a/l Anbil Shankar, OOI HUI SHENG, LIM JIA SHENG
Name of the heaviest patients:  LAU MING JI, MUTHURAMAN A/L DARSSHAN

Ln 1, Col 1
```

Figure 5.7, *Figure 5.8*, *Figure 5.9* patientRecord.txt file

Figure 5.7, *Figure 5.8*, *Figure 5.9* shows the patientRecord.txt file produced by the data key in as shown above.

Overall a complete program with proper design and make used of functions to complete all requirements. Well done.