MSC Artificial Intelligence
Brunel University London

Assignment

On

Heart Disease Prediction Using Various Machine Learning Models

Module Code: CS5812

Module Title: Predictive Data Analysis

Assignment Title: Predictive Data Analysis

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SUBMITTED BY:

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1. Data description and research question.

Data background information

This heart disease dataset is curated by combining five popular heart disease datasets already available independently but not combined before. In this dataset, five heart datasets are combined with over 11 common features which makes it the largest heart disease dataset available so far for research purposes. The five datasets used for its curation are:

- Cleveland
- Hungarian
- Switzerland
- Long Beach VA
- Statlog (Heart) Data Set.

The original data came from: https://ieee-dataport.org/open-access/heart-disease-dataset-comprehensive

Data description

1. age - Age, age in years (data type - numeric)
2. sex – Sex (data type - binary):
    - 1 = male.
    - 0 = female.
3. chest pain type - chest pain type (data type - nominal):
    - Value: 1- Typical angina: chest pain-related decreased blood supply to the heart.
    - Value: 2 - Atypical angina: chest pain not related to the heart.
    - Value:3 - non-anginal pain: typically, esophageal spasms (non-heart related);
    - Value 4: - Asymptomatic: chest pain not showing signs of disease.
4. resting blood pressure – resting.bp.s (in mm Hg on admission to the hospital), (data type numeric):
    - anything above 130-140 is typically cause for concern.
5. serum cholesterol - Cholesterol in mg/dl (data type numeric):
    - serum = LDL + HDL + .2 * triglycerides.
    - above 200 is cause for concern.
6. fasting blood sugar - fasting blood sugar (1,0 > 120 mg/dl), (data type - binary):
    - 1 = true.
    - 0 = files;
    - '>126' mg/dl signals diabetes.
7. resting electrocardiogram results -restecg results (data type - nominal):
    - Value: 1 - Nothing to note.
    - Value: 2 - ST-T Wave abnormality:
        - can range from mild symptoms to severe problems.
        - signals non-normal heartbeat.
    - Value: 3 - Possible or definite left ventricular hypertrophy:
    - Enlarged heart's main pumping chamber.
8. maximum heart rate achieved - max heart rate (71 - 202), (data type – numeric.
9. exercise-induced angina - exercise angina (data type binary):

- 1 = yes.
- 0 = no.

10. oldpeak =ST - oldpeak(depression induced by exercise relative to rest), (data type - numeric):
    - looks at the stress on the heart during exercise.
    - unhealthy heart will stress more.
11. The slope of the peak exercise ST-segment - ST slope (data type - nominal):
    - Value: 1 - Up sloping: better heart rate with exercise (uncommon).
    - Value: 2 - Flat sloping: minimal change (typical healthy heart).
    - Value: 3 - Down sloping: signs of an unhealthy heart.
12. target - have disease or not (1=yes, 0=no) (= the predicted attribute) (data type - binary)

Note: No personally identifiable information (PPI) can be found in the data set.

Research Question

In a statement:

Given clinical parameters about the patient, we can predict whether they have heart disease or not.

2. Data preparation and cleaning.

Each data point contains 11 features and there are 1191 data point in the original dataset e.g., X = {x1, x2, x3, …x11}. I hypothesize that there is a structure in the dataset that would lead to the solution. The output would be the structural pattern (model, tree, etc.). Hence the complete representation can be said to be in matrix format. The data is represented as a table. Looking at the data dictionary I can see that the target or labels are numeric of interval/binary. This hints to me that the problem falls in the group of methods call classification and it belongs to a group of supervised learning. Logistics regression can also be used for classification problems. What I am going to look for is how the label (target values) are associated with each of the data points(concept).

In clinical epidemiological research, errors occur despite careful study design, conduct, and implementation of error-prevention strategies. Data cleaning intends to identify and correct these errors or at least minimize their impact on study results (*Data Cleaning: Detecting, Diagnosing, and Editing Data Abnormalities*, no date). This idea of data cleaning applies to all research areas. My data cleaning plan:

1. Detecting missing values.
2. Imputing missing values / removing incomplete instances.
3. Detecting duplicate values. This dataset is a merger of a few datasets, it may contain duplicates.
4. Removing duplicate instances. This would avoid biased learning.
5. Simple outlier detection using a box plot.
6. Remove outliers.

We first load the data calling the .csv function (data is a .csv file) and assign it to heart. Using the dim function heart.csv had 1190 observations and 12 features, and one of those features is the target variable. Using Diagnose(heart.csv), I observed that all the data types except one were an integer, and the exception was numeric. At this point I compare my finding to that of the data dictionary, focusing on whether the numeric data type could have been categorical or not. It was numerically based on the feature.

From the table, I can see that the Variables match the data type as given in the data dictionary above. For example, an age which is a variable match with its' type which is an integer, and this is true for all variables and types. There are no missing values. The unique count shows two values for the target feature, and this is correct, it seems all the other counts for this feature look good. There is a potential problem of having a duplicate since this data set is a merger of four different heart disease data sets. There is also a need to check for outliers. I then look at the centrality and call "diagnose_numeric" and this shows me mean, median, mode, Q1, Q3, min, max, and outlier figures. There are outliers. I should plot these features showing with outliers and without outliers visualizing them using a boxplot and histogram. Looking at the statistical dispersion, I can observe:

- Age - positive skewness, Kurtosis none, min and max values look to be right.
- Sex - negative skewness and outliers were present.
- Chest. pain.type - negative skewness and outliers were present.
- Resting.bp.s - negative skewness and outliers were present.
- Cholesterol - negative skewness and outliers were present.
- Fasting. blood - positive skewness and outliers were present.
- resting.ECG - positive skewness
- max. heart. rate - positive skewness and outliers were present. I will look into this further.
- exercise. again - positive skewness
- oldpeak - negative skewness
- ST.slope - negative skewness and outliers were present.
- target - negative skewness and this had a small imbalance.
- In general, the interquartile range 1 and 3 are small, which means that the data is clustered around the median.
- We have no categorical features.

It is now time to clean and prepare the data. Since both the function and the boxplot identified outliers, I have chosen to remove them based on this fact. The next step was to identify duplicate rows and remove them. After this process, the data frame remained with 1018 observations and 12 features. 477 had the disease and 541 did not have the disease. What we have is a balanced dataset.

3. Exploratory data analysis

The principal component analysis (PCA) variance plot showed that seven dimensions explain 80 percent of the information that is contained in the dataset. Looking at the loadings graph PC1 (Principal Component) vs PC2 as heart rate decreases, age increases, and chest pain increase so too do target increases. PC1 Vs PC2 had three groups and within the groups, each member was positively correlated to each other and negatively correlated to other group members. These features also dominate PC (principal component)1 and PC2. I shall seek to further investigate these variables later. The final data was then saved to "Clean_heart_data.csv" for further work to be done on Google Collab to carry out further exploration.

A scatter plot of max heart rate vs age shows that heart disease is densely populated in the sector with higher age. I then looked at a graph of heart disease versus chest pain. A bar chart with heart disease frequency per chest pain type two and three has more heart disease count. Finally, the correlation matrix showed a strong relationship between target and St slop and exercise angina. The results seem to corroborate some of the findings in the PCA.

For the machine learning task, I have chosen to use Random Forest prediction. This model allows me to use high-dimensionality data, and this fact also applies to my deep learning model Artificial Neural Network.

Classification models are used to predict the class of an object, based on its features. The need for trusting computational predictions tends to be particularly strong in medical applications. (*Comprehensible classification models: a position paper: ACM SIGKDD Explorations Newsletter: Vol 15, No 1*, no date). Hence, the public trusts the models and we can use them. Given clinical parameters about a patient and as seen in the data described above the target variable is binary, we can build a model to predict whether they have heart disease or not (Concept I wish to learn). Early, accurate, and efficient diagnosis would allow for early treatment and reduce the impact of the disease on the quality of life of individuals. We have labeled data that is greater than 50 samples and it is of integers type and given that the target is binary it means that this is a binary classification problem.

4. Machine learning prediction

Random Forest Classifier.

Random Forest uses a tree-based topology. First, it randomly selects a subset of the training data. From this subset, it builds a decision tree. It is then used to predict the test data. To form the final prediction, the predictions from the decision trees are combined. The random forest uses the logistic function as the activation function. It maps input data to output classes.

Through training, Random Forest algorithm weights and biases are learned. An algorithm begins with a random set of weights and biases. Based on the training data, the weights and biases are adjusted. Weights and biases are used to make predictions based on the test data. Each tree contains a subsample of data and attributes. Patients with heart disease are the target variable. The model predicts whether a patient has heart disease at a cut point value (0 or 1). From what I read online 900 trees gave good results and that is what I would use for my model.

Here are my implementation steps:

I will split the data into x and y. "Y" will be assigned to the target variable. To ensure that the target is no longer in the dataset, I will view "x" in the dataset. I can now split the data into Test and Train, with Test size being 20%. Import Random Forest Classifier, build the model, fit the model, and predict.

Artificial Neural Network

My neural network is feed-forward. In this type of neural network, input data is passed through a series of hidden layers. A hidden layer would consist of several neurons, and each neuron's output would be passed on to the next layer. Each possible output would be represented by one neuron in the output layer. If someone has heart disease, the neural network will predict it.

A Sequential model with four dense layers was used to implement the ANN. In the first three layers, the 12 neurons were activated by 'ReLU'. As this is a binary classification problem, I will use a sigmoid function to activate the output layer. The model was fitted with a batch size of 12 and 100 epochs. On x_train and x_test, features are scaled. In this scenario, features, weights, and biases could be calculated more quickly to obtain the value of a neuron. The computation of backpropagation would also be faster because the derivatives would be smaller, resulting in the gradient descent curve reaching global minima more quickly. For scaling, Keras' StandardScaler() is used.

ReLU returns the maximum of two values, either the value itself or zero. Hidden layers use the maximum value of the input data. Probability is calculated using the sigmoid function. Input data is used to calculate the probability that output data belongs to a certain class. Keras strongly suggests using the ReLU function with the kernel initializer "he_uniform" and the Sigmoid activation function with "glorot_uniform."

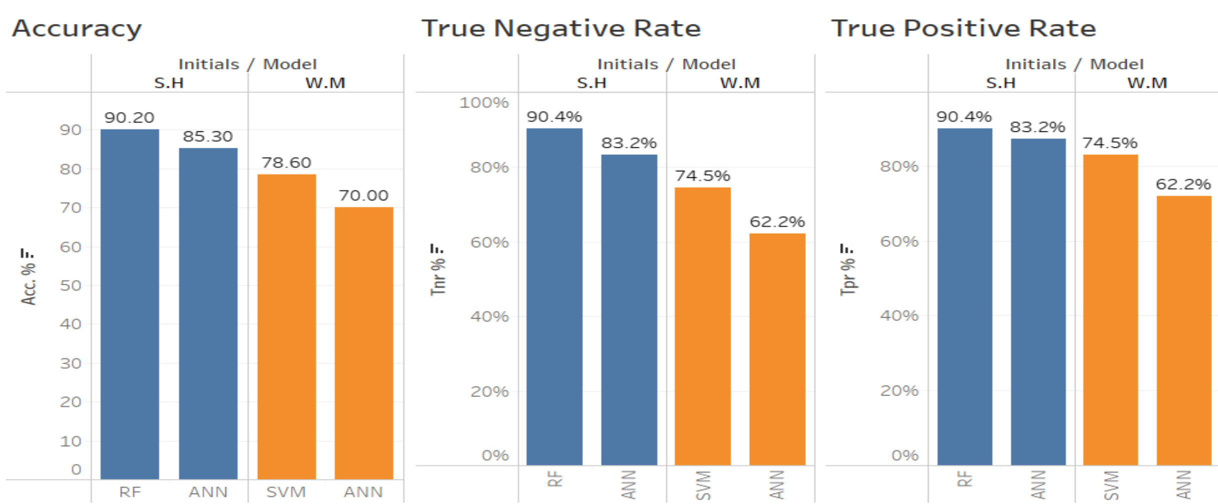
In place of the traditional stochastic gradient descent algorithm, I have chosen Adam as an optimization algorithm. It is a combination of the RMSprop and stochastic gradient descent with momentum algorithms. Also, to measure the distance between the predicted labels and the true labels I will use Binary cross entropy because this is a loss function used in binary classification problems as suggested by Keras documentation.

The ANN was implemented for heart disease classification using the following steps:

1. The data set was divided into training and testing sets (80/20 split).
2. The training set was used to train (build the model) the ANN.
3. Testing set was used to evaluate the performance of the ANN.
4. The results showed that the ANN was able to classify the heart diseases.

5. Performance evaluation and Discussion.

Figure. 1



Model Results

Initials	Model	Activation fun..	Kenernel Initializer	No. epoc..	Trees	Optimizer	FN	FP	TN	TP
S.H	ANN	ReLU/ Sigmoid	he_uniform/Glorot_..	100	NA	Adamax	21.0	24.0	119.0	142.0
	RF	NA	NA	NA	900	NA	10.0	10.0	94.0	90.0
W.M	ANN	ReLU/ Sigmoid	he_uniform/Glorot_..	80	NA	Adam	38.0	34.0	70.0	72.0
	SVM	NA	NA	NA	NA	NA	26.0	39.0	114.0	127.0

Figure 1 shows the overall accuracy, true negative rate, and true positive rate for a binary classification project. Both S.H(Sookchand Harripersad) and W.M(William Marshall) used the same dataset. However, William used 4 features (4072 training samples) and Sookchand used all twelve features. Sookchand RF (Random Forest) and ANN (Artificial Neural network) received 90.2% and 85.3% overall accuracy, respectively and both were higher than the William model's overall accuracy of 78.6% and 70% for both SVM (Support Vector Machine) and ANN respectively. It is a known fact that ANN requires massive training data due to the large number of parameters it needs to learn. William's choice to reduce the dataset to only four features as seen in the results reduces his model's performance.

We can also observe that TNR (true negative rate) and TPR (true positive rate) received higher scores for both Sookchand models even though SVM usually performs well. Since both Sookchand and Williams used ANN with the same number of layers, same activation function but with different sample sizes, we can deduce that the sample size resulted in poor performance. The principal component analysis (PCA) showed that 7 features accounted for 80% of the data (see variance plot). Hence William's model's poor performance for both models was due to his feature selection method. The four features he chose did not represent enough of the data which can be observed on the PCA variance plot.

Given that the dataset is balanced, accuracy is one of the measures whereby we can determine the best fit model. This means that we do not have to worry about the tradeoff concerning sensitivity and specificity with unbalanced data. Also, when considering the appropriateness of the model to the research question some things need to be addressed. We have a data set that is used to train and build a model to predict whether a person has heart disease. If a person gets a false positive reading that they have heart disease when they do not," it is much better than if they got a false-negative "reading they do not have heart disease when they do." It is more likely that the patient that got a false positive would get a second opinion to verify if the results were correct. However, a person that gets a false negative would go away thinking all is well and resulting in increased risk to the patient, etc. As seen in figure 1 RF received the best value TNR. The results show that the size of the training data plays an important role in determining how the models perform.

The random forest classifier used to make heart disease prediction confusion matrix results is [[90 10] [10 94]]. The results of the confusion matrix show that the random forest classifier was very accurate in its predictions. The classifier was able to correctly predict 90% of the cases of heart disease and 90% of the cases of no heart disease. However, there is still a 10% error rate, which means that the model is not perfect. In contrast to the other model, it is the best solution we have for predicting heart disease.

Since medical records are often incomplete the RF model is insensitive to this making it a good fit, unlike neural networks which can be sensitive to missing data. Another feature of RF that makes it a better fit than the neural network is that it can provide the features it used to make the prediction (new knowledge). Roßbach (no date) said "more recently, however, approaches have been developed to identify the most representative trees in an ensemble. Using their analysis, the ensemble can finally be interpreted." Hence, Random Forest results can be explained, unlike neural networks. The random forest can give you the features used to predict whereas a neural network is a black box.

Therefore, I would recommend the RF model because it has higher accuracy figures, an explain-ability component, new knowledge generation, and the ability to be widely applied regardless of whether the data is normally distributed. These are all necessary for my view for a heart disease model to answer the research question. Lastly, the RF model can be used to predict unseen data (giving us new information).

6. Data management plan and Authorship

Please see the appendix under the section heading: Data Management Plan for Research Students.

"Authorship Contribution" statement (ACS): Mr. Sookchand Harripersad designed the data collection, performed the exploratory data analysis, and implemented and applied the random forest predictor and Artificial Neural Network predictor. William Marshall implemented and applied a support vector machine and an Artificial Neural Network predictor. Zeerak Jawed, Sadam Khan, and Rehab Musse did not participate or responded to any communication effort (please see attachment of all email communication).

Bibliography

Comprehensible classification models: a position paper: ACM SIGKDD Explorations Newsletter: Vol 15, No 1 (no date). Available at: https://dl.acm.org/doi/abs/10.1145/2594473.2594475 (Accessed: 10 March 2022).

Data Cleaning: Detecting, Diagnosing, and Editing Data Abnormalities (no date). Available at: https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.0020267 (Accessed: 14 March 2022).

Roßbach, D.P. (no date) 'Neural Networks vs. Random Forests – Does it always have to be Deep Learning?', p. 8.

Appendix

Data Management Plan for Research Students

1. Overview

Researcher: Sookchand Harripersad
Project title: Predictive Data Analysis
Project duration: 21 days
Project context: *What is the discipline and subject of your research?* *Machine & Deep Learning project CS5812, Heart Disease Prediction*

2. Defining your data/research sources

2.1 Where will your data/research sources come from? The original data came from: https://ieee-dataport.org/open-access/heart-disease-dataset-comprehensive
2.2 How often will you get new data? *Continuously or just from discrete experiments? No other time will I get new data.* *How many experiments per week? 2 experiments per week.* *How will this change over time? All experiments will cease upon completion of the project.*
2.3 How much data/information will you generate? *Try to state this in kB/MB/GB. I will generate approximately 1 G.* *How much have you got so far? I have 39 K.*

Try to estimate how this will grow for the rest of the project. It will not grow.
2.4 What file formats will you use? *What software is required to access the data? Are free/open alternatives available? Microsoft Excel, Google Collab, and RStudio will be used.* *What type of data does each format hold? The file is a csv file.*

3. Organising your data

3.1How will you structure and name your folders and files? *Are there any set or recommended standards in your discipline? Heart and df are the names of the names I have chosen to use.*
3.2 What additional information is required to understand each data file? *What would you need to know to reproduce the results from this data? Python and R are used for this project.*
3.3 What different versions of each data file or source will your create? How will you differentiate between different versions, for example do you plan to use files names to denote different versions, e.g. V1, V1.1, V2 etc? The file name Heart is the clean file and it is imported into Google Collab and assigned to the name df.

4. Looking after your data

4.1 Where will you store your data? *Laptop? USB drive? Network storage? In the cloud? The date will be stored on my laptop.*
4.2 How will your data be backed up? *How many copies? I will make two copies.* *Where are they stored? Both copies will be stored on the laptop.* *How often are copies updated? No update to copies will be done.*
4.3 How will you test whether you can restore from your backups? *I will not be using the back, therefore it will be in its original form.*

5. Sharing your data

5.1 Who owns the data you generate? *Is it you? Your supervisor? The University? An external partner? The university will be the owners of the data being generated.*
5.2 Who else has a right to see or use this data? *Your supervisor, collaborators, group members? The examiners and my group mates will have access to the data.*
5.3 Who else should reasonably have access to this data when you share it? *Readers of your published work? The General Public? No one else.*

5.4 What should/shouldn't be shared and why? *Consider any ethical, legal, or commercial restrictions that may affect what you share, how you share it and who you share it with? This data is stored in a public database for anyone to use. This dataset does not contain any personal Data. Hence, there are no concerns.*

6. Archiving your data

6.1 What should be archived beyond the end of your project? *Everything? Just what you use for your thesis? Just what I sued for the thesis.*
6.2 For how long should it be stored? *EPSRC guidelines say, "10 years from the date of last access". 10 years.*
6.3 When will files be moved into the data archive/repository? *As you complete the analysis of each file? When do you submit your thesis? Upon submission of a thesis on 25/04/2022.*
6.4 Where will the data be stored? *Disciplinary repository (e.g. crystallography databases)? X drive? Opus? I will not store the data.*
6.5 Who is responsible for moving data to the data archive and maintaining it? *You? Your supervisor? The University? The university.*

6.6 Who should have access and under what conditions? *Are there any embargoes necessary? There are no embargoes.*

7. Executing your plan

7.1 Who is responsible for making sure this plan is followed? *You may wish to discuss and agree this with your supervisor. The supervisor.*
7.2 How often will this plan be reviewed and updated? *You may wish to discuss and agree this with your supervisor. The supervisor will decide this.*
7.3 What actions have you identified from the rest of this plan? *List them here with timescales. None.*
7.4 What further information do you need to carry out these actions? *Where can you find this information?* *Who might you be able to ask?*

Notes on completing this form

- Type as much (or as little) as you feel you need to into each box: it will expand to accommodate what you write;
- You can leave or remove the prompts in grey once you're done;
- For help with completing this DMP, please contact researchdata@brunel.ac.uk

Integrated Assesment

S.Harripersad

09/02/2022

R Markdown

Evaluation

If we can reach 95% accuracy at predicting whether or not a patient has heart disease during the proof of concept, we'll pursue the project.

Predicting Heart disease using machine learning

This notebook looks into using various Python-based machine-learning and data science libraries in attempt to build a machine learning model capable of predicting whether or not someone has heart disease based on their medical attribute.

I am going to take the following approach: 1. Problem Definition. 2. Data. 3. Evaluation. 4. Features. 5. Modelling. 6. Experimentation

Problem Definition

In a statement: Given clinical parameters about a patient, can we predict whether our not they have heart disease.

Data

This heart disease dataset is curated by combining 5 popular heart disease datasets already available independently but not combined before. In this dataset, 5 heart datasets are combined over 11 common features which makes it the largest heart disease dataset available so far for research purposes. The five datasets used for its curation are:

- Cleveland
- Hungarian
- Switzerland
- Long Beach VA
- Statlog (Heart) Data Set.

The original data came from: https://ieee-dataport.org/open-access/heart-disease-dataset-comprehensive

Data Description - Features

##Create Data Dictionary

1. age - Age, age in years(data type - numeric)
2. sex - Sex(data type - binary):
   - 1 = male;
   - 0 = female.
3. chest pain type - chest pain type(data type - nominal):
   - Value: 1- Typical angina: chest pain related decrease blood supply to the heart;
   - Value: 2 - Atypical angina: chest pain not related to heart;
   - Value: 3 - Non-anginal pain: typically esophageal spasms (non heart related);
   - Value: 4 - Asymptomatic: chest pain not showing signs of disease.
4. resting blood pressure - resting bp s(in mm Hg on admission to the hospital), (data type numeric):
   - anything above 130-140 is typically cause for concern.
5. serum cholesterol - Cholesterol in mg/dl(data type numeric):
   - serum = LDL + HDL + .2 * triglycerides;
   - above 200 is cause for concern;
6. fasting blood sugar - fasting blood sugar(1,0 > 120 mg/dl), (data type - binary):
   - 1 = true;
   - 0 = false;
   - '>126' mg/dL signals diabetes.
7. resting electrocardiogram results -restecg results(data type - nominal):
   - Value: 1 - Nothing to note;
   - Value: 2 - ST-T Wave abnormality:
   - can range from mild symptoms to severe problems;
   - signals non-normal heart beat.
   - Value: 3 - Possible or definite left ventricular hypertrophy:
   - Enlarged heart's main pumping chamber.
8. maximum heart rate achieved - max heart rate(71 - 202), (data type - numeric)
9. exercise induced angina - exercise angina(data type binary):
   - 1 = yes;
   - 0 = no.
10. oldpeak =ST - oldpeak(depression induced by exercise relative to rest), (data type - numeric):
    - looks at stress of heart during exercise;
    - unhealthy heart will stress more.
11. the slope of the peak exercise ST segment - ST slope(data type - nominal):
    - Value: 1 - Up sloping: better heart rate with exercise (uncommon);
    - Value: 2 - Flat sloping: minimal change (typical healthy heart);
    - Value: 3 - Down sloping: signs of unhealthy heart.
12. target - have disease or not (1=yes, 0=no) (= the predicted attribute) (data type - binary)

Note: No personal identifiable information (PPI) can be found in the data set.

```r
# install the caret, rpart and ROCR packages from CRAN
if(require(caret) == FALSE){
  install.packages('caret', dependencies = TRUE)
  library(caret)
}

## Loading required package: caret

## Loading required package: ggplot2

## Loading required package: lattice

if(require(rpart) == FALSE){
  install.packages('rpart')
  library(rpart)
}

## Loading required package: rpart

if(require(ROCR) == FALSE){
  install.packages('ROCR')
  library(ROCR)
}

## Loading required package: ROCR

# for a full list of models available in the caret packages:
#   http://topepo.github.io/caret/available-models.html
# for each model the list of tunable parameters is available
#   from the caret command modelLookup
```

Loading package

```r
library(dplyr) #A Grammar of Data Manipulation

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union

library(tibble) #modern take on data frames.
library(dlookr) #Tools for Data Diagnosis, Exploration, Transformation (main
library)
```

```
##
## Attaching package: 'dlookr'

## The following object is masked from 'package:base':
##
##     transform

library(tidyverse)

## -- Attaching packages --------------------------------------- tidyverse
1.3.1 --

## v tidyr   1.2.0     v stringr 1.4.0
## v readr   2.1.2     v forcats 0.5.1
## v purrr   0.3.4

## -- Conflicts ------------------------------------------
tidyverse_conflicts() --
## x tidyr::extract() masks dlookr::extract()
## x dplyr::filter()  masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## x purrr::lift()    masks caret::lift()

library(flextable)

##
## Attaching package: 'flextable'

## The following object is masked from 'package:purrr':
##
##     compose

library(Hmisc)

## Loading required package: survival

##
## Attaching package: 'survival'

## The following object is masked from 'package:caret':
##
##     cluster

## Loading required package: Formula

##
## Attaching package: 'Hmisc'

## The following object is masked from 'package:dlookr':
##
##     describe
```

```
## The following objects are masked from 'package:dplyr':
##
##     src, summarize

## The following objects are masked from 'package:base':
##
##     format.pval, units

library(prettydoc)
library(corrr)

##
## Attaching package: 'corrr'

## The following object is masked from 'package:dlookr':
##
##     correlate

library(parsnip)

##
## Attaching package: 'parsnip'

## The following object is masked from 'package:Hmisc':
##
##     translate

library(broom)
library(yardstick)

## For binary classification, the first factor level is assumed to be the
event.
## Use the argument `event_level = "second"` to alter this as needed.

##
## Attaching package: 'yardstick'

## The following object is masked from 'package:readr':
##
##     spec

## The following objects are masked from 'package:caret':
##
##     precision, recall, sensitivity, specificity

library(caret)
library(datarium)
library(ROCR)
library(forecast)

## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

```
##
## Attaching package: 'forecast'

## The following object is masked from 'package:yardstick':
##
##     accuracy

library(rms)

## Loading required package: SparseM

##
## Attaching package: 'SparseM'

## The following object is masked from 'package:base':
##
##     backsolve

library(janitor)

##
## Attaching package: 'janitor'

## The following objects are masked from 'package:stats':
##
##     chisq.test, fisher.test

library(vtree)
```

2. Data exploration and preparation

```
# read the data from a .csv file
heart <- read.csv("heart_statlog_cleveland_hungary_final.csv",na.strings =
c("NA", ""))

dim(heart)

## [1] 1190   12

# inspect the data
diagnose(heart) %>% flextable()
```

variables	types	missing_count	missing_percent	unique_count	unique_rate
age	integer	0	0	50	0.042016807
sex	integer	0	0	2	0.001680672
chest.pain.type	integer	0	0	4	0.003361345
resting.bp.s	integer	0	0	67	0.056302521
cholesterol	integer	0	0	222	0.186554622
fasting.blood.sugar	integer	0	0	2	0.001680672
resting.ecg	integer	0	0	3	0.002521008
max.heart.rate	integer	0	0	119	0.100000000
exercise.angina	integer	0	0	2	0.001680672
oldpeak	numeric	0	0	53	0.044537815
ST.slope	integer	0	0	4	0.003361345
target	integer	0	0	2	0.001680672

From the table above I can see that the Variables matches the data type as given in the data dictionary above. For example age which is a variable matches with its' type which is an integer(numeric) and this is true for all variables and types. There are no missing values. There is a potential problem of having duplicate since this data set is a merger of four different heart disease data set. There is also a need to check for ouliers.

Numeric value analysis

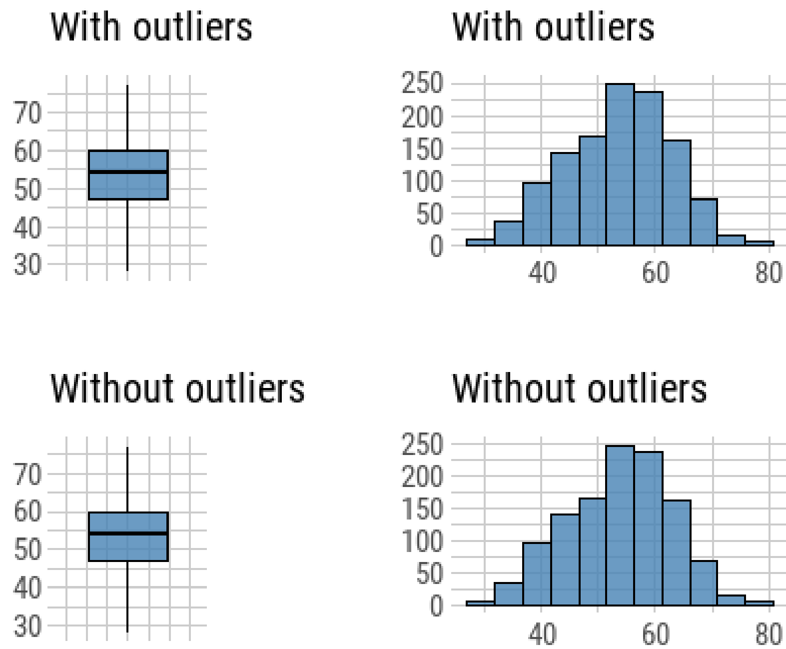
```
diagnose_numeric(heart) %>% flextable()
```

variables	min	Q1	mean	median	Q3	max	zero	minus	outlier
age	28.0	47	53.7201681	54.0	60.00	77.0	0	0	0
sex	0.0	1	0.7638655	1.0	1.00	1.0	281	0	281
chest.pain.type	1.0	3	3.2327731	4.0	4.00	4.0	0	0	66
resting.bp.s	0.0	120	132.1537815	130.0	140.00	200.0	1	0	37
cholesterol	0.0	188	210.3638655	229.0	269.75	603.0	172	0	192
fasting.blood.sugar	0.0	0	0.2134454	0.0	0.00	1.0	936	0	254
resting.ecg	0.0	0	0.6983193	0.0	2.00	2.0	684	0	0
max.heart.rate	60.0	121	139.7327731	140.5	160.00	202.0	0	0	1
exercise.angina	0.0	0	0.3873950	0.0	1.00	1.0	729	0	0
oldpeak	-2.6	0	0.9227731	0.6	1.60	6.2	455	13	11
ST.slope	0.0	1	1.6243697	2.0	2.00	3.0	1	0	0
target	0.0	0	0.5285714	1.0	1.00	1.0	561	0	0

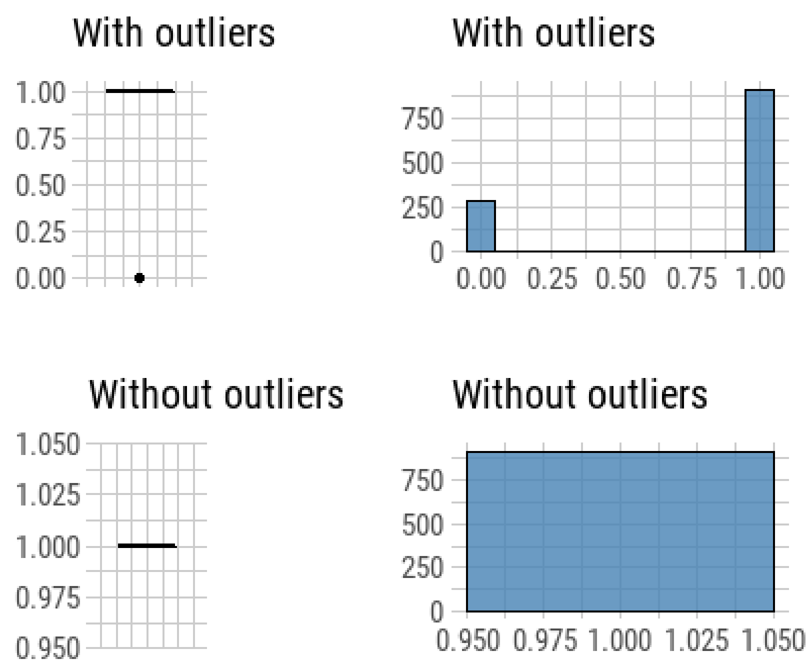
Plotting for each feature.

```
plot_outlier(heart)
```

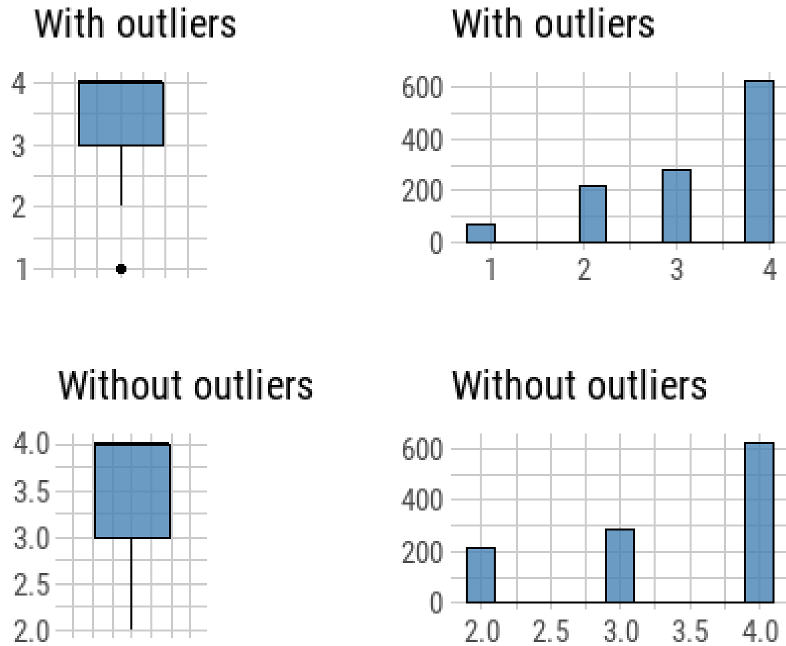
Outlier Diagnosis Plot (age)



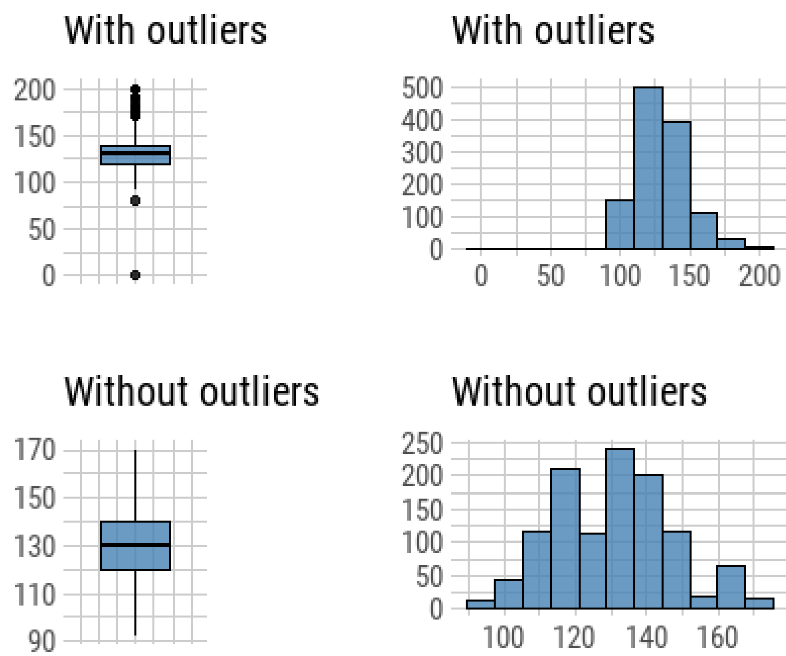
Outlier Diagnosis Plot (sex)

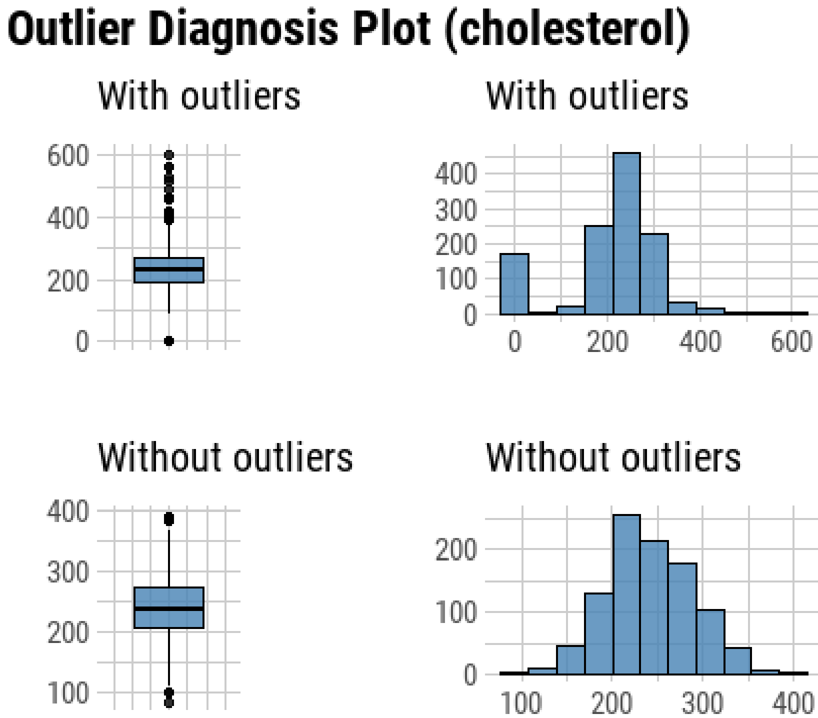


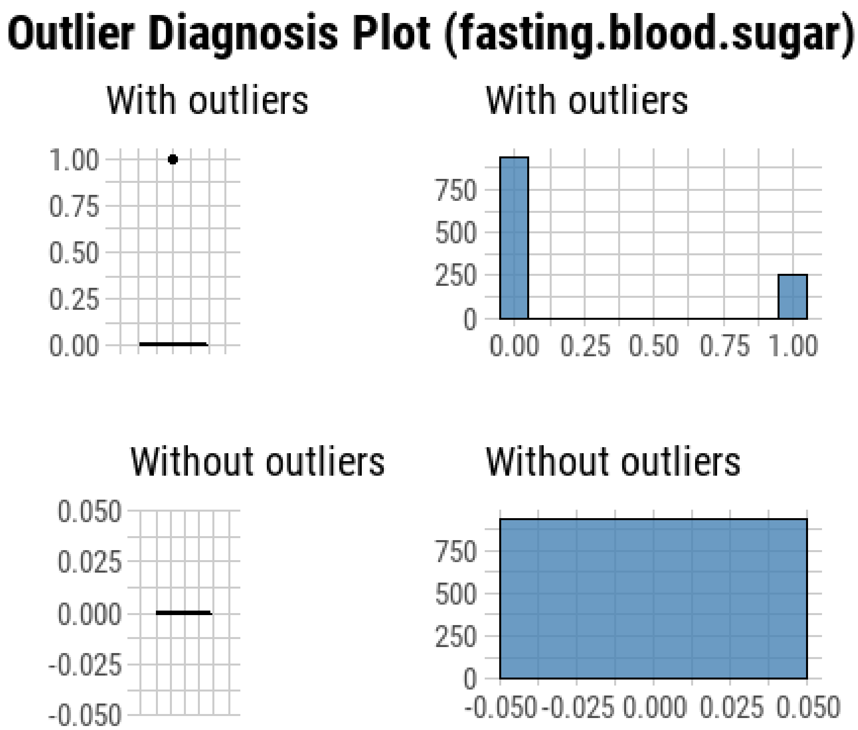
Outlier Diagnosis Plot (chest.pain.type)



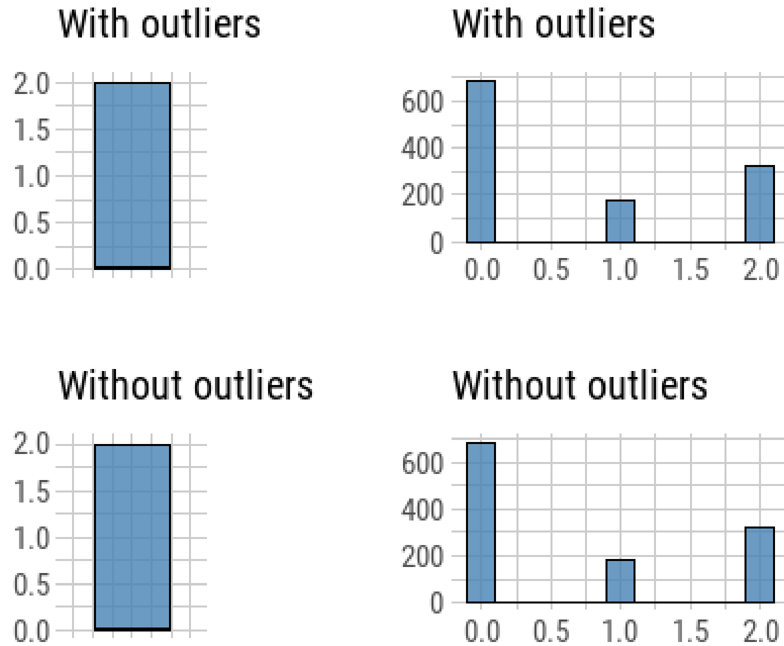
Outlier Diagnosis Plot (resting.bp.s)



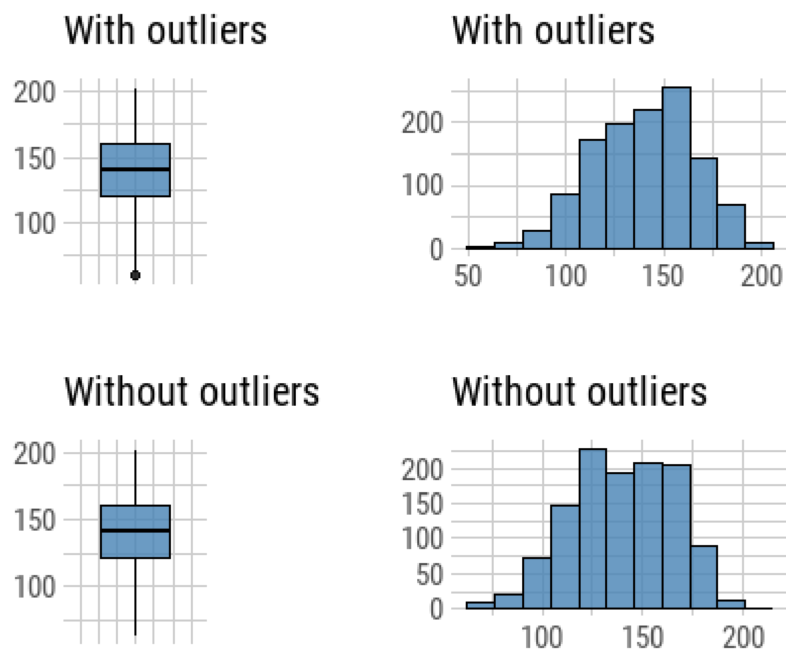

Outlier Diagnosis Plot (cholesterol)
With outliers
With outliers
Without outliers
Without outliers
600
400
200
0
400
300
200
100
0
0
200
400
600
400
300
200
100
200
100
0
100
200
300
400


Outlier Diagnosis Plot (fasting.blood.sugar)
With outliers
With outliers
Without outliers
Without outliers
1.00
0.75
0.50
0.25
0.00
750
500
250
0
0.00
0.25
0.50
0.75
1.00
0.050
0.025
0.000
-0.025
-0.050
750
500
250
0
-0.050
-0.025
0.000
0.025
0.050

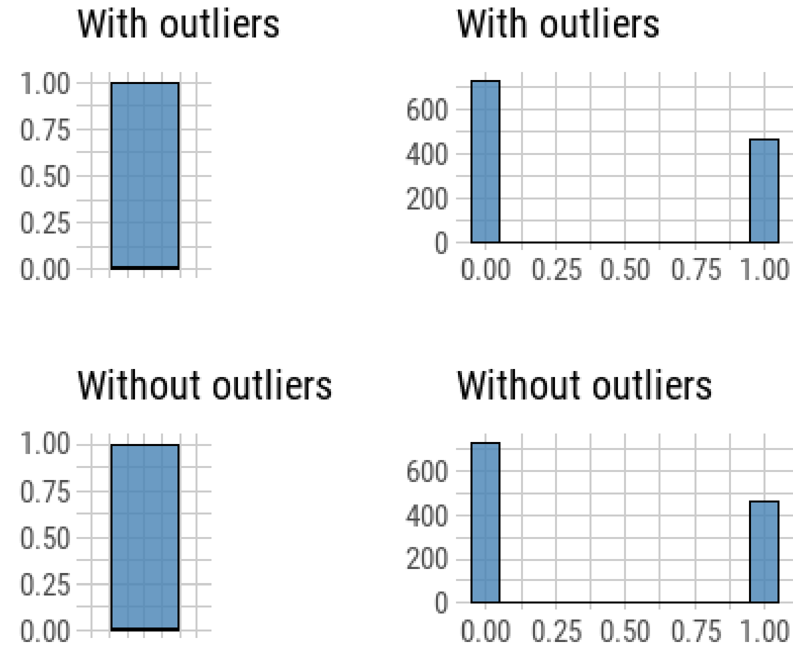
Outlier Diagnosis Plot (resting.ecg)



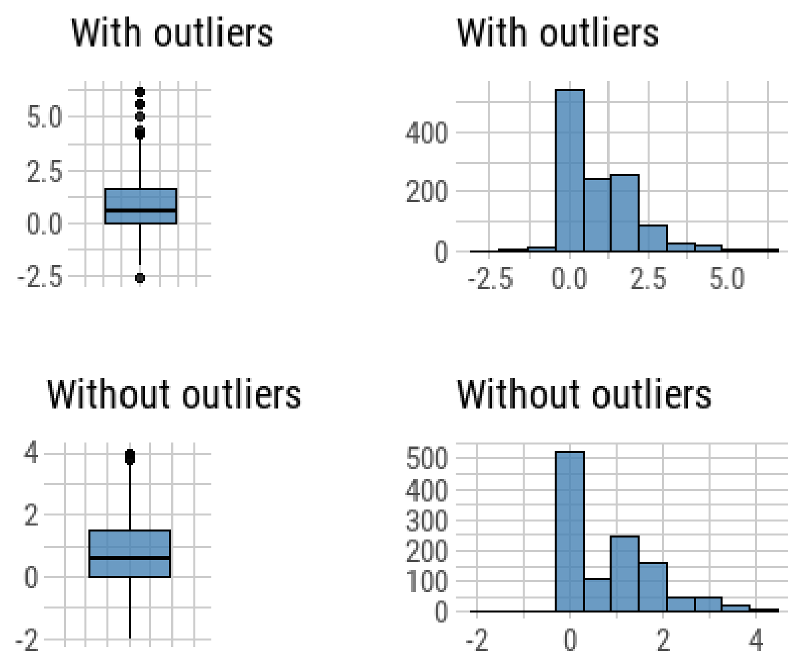
Outlier Diagnosis Plot (max.heart.rate)

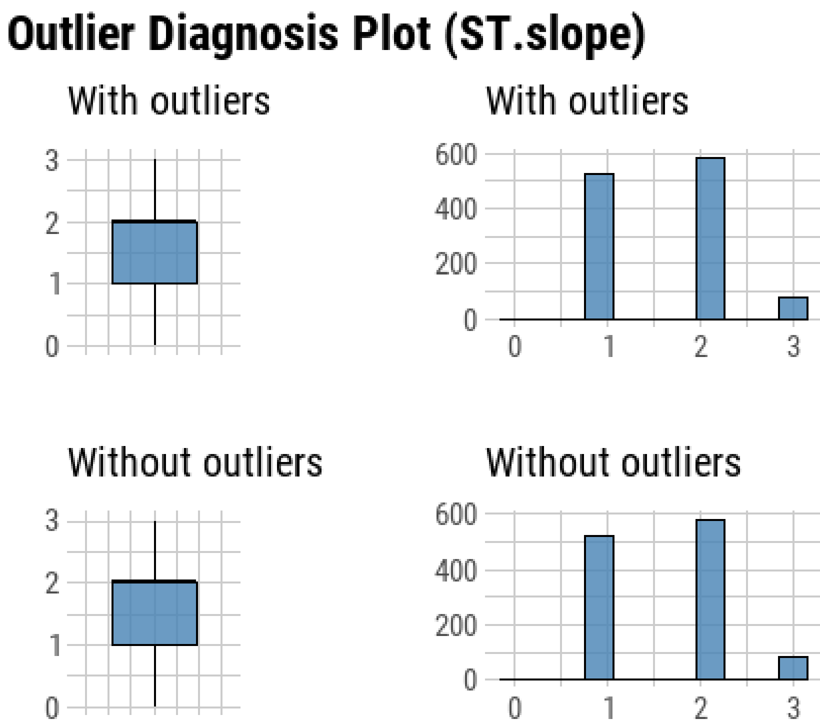


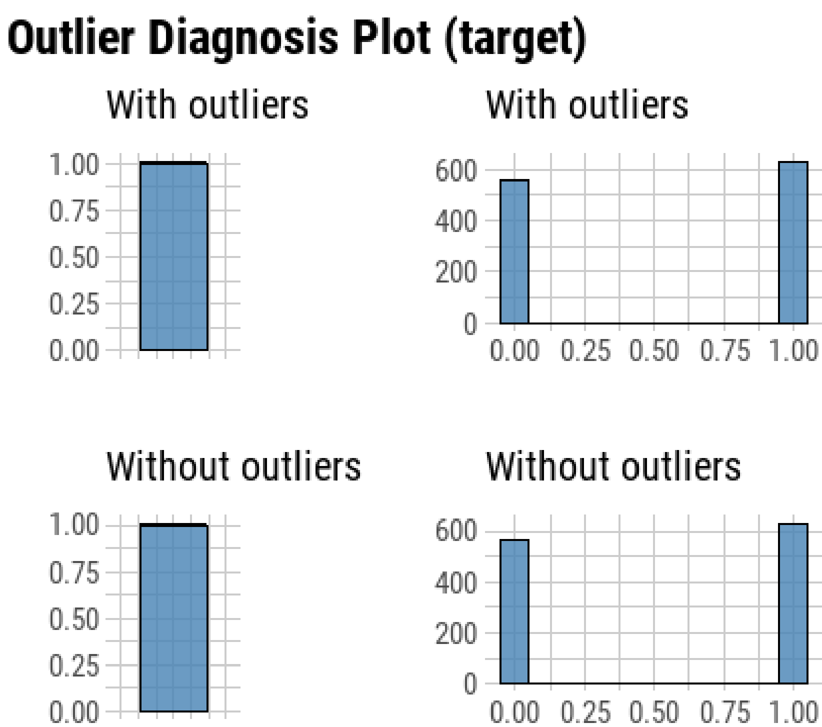
Outlier Diagnosis Plot (exercise.angina)



Outlier Diagnosis Plot (oldpeak)







Upon analysis of this table I can see several problem: 1. Variables with outliers include: * sex; * chest.pain.type * resting.bp.s * cholesterol * fasting.blood.sugar; * max heart.rate; * ST.slop

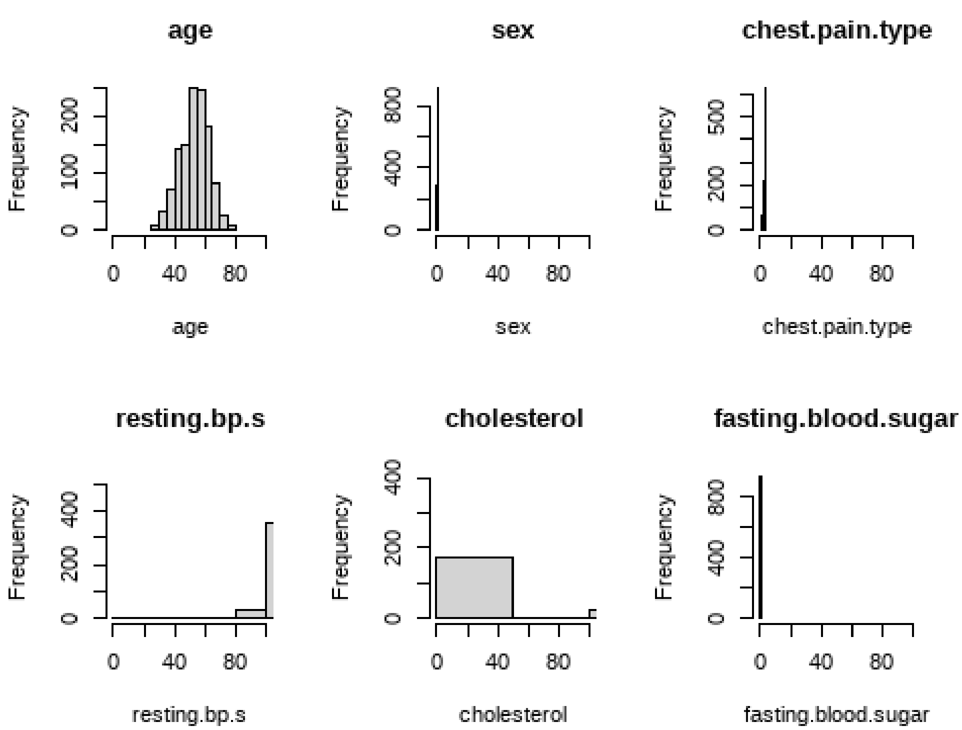
2. Missing values:

- cholesterol = 0. This data is numeric and no one alive has a cholesterol reading 0 mg/dl. It means that this most likely was missing data that was given a value of 0.

Lets us plot the outliers

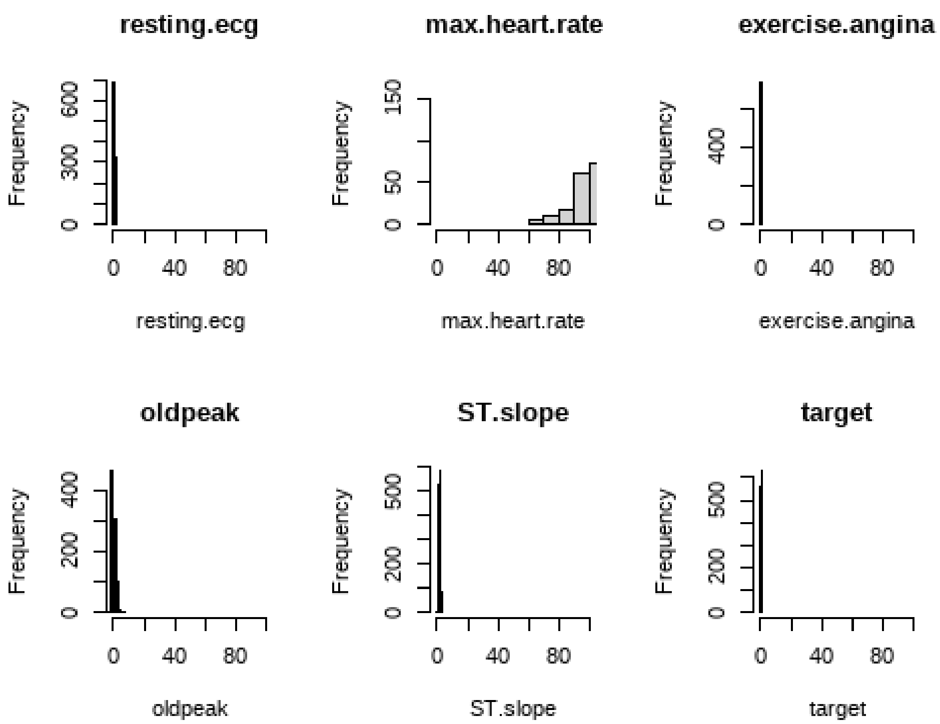
#Graphical Analysis

```
# generate a histogram for each variable (and show them on the same page)
#   note: titles and x labels are set to the name of the relevant variable
opar <- par(no.readonly = TRUE)
par(mfrow = c(2,3))
hist(heart[, 1], main = names(heart)[1], xlab = names(heart)[1], xlim =
c(0,100))
hist(heart[, 2], main = names(heart)[2], xlab = names(heart)[2], xlim =
c(0,100))
hist(heart[, 3], main = names(heart)[3], xlab = names(heart)[3], xlim =
c(0,100))
hist(heart[, 4], main = names(heart)[4], xlab = names(heart)[4], xlim =
c(0,100))
hist(heart[, 5], main = names(heart)[5], xlab = names(heart)[5], xlim =
c(0,100))
hist(heart[, 6], main = names(heart)[6], xlab = names(heart)[6], xlim =
c(0,100))
```

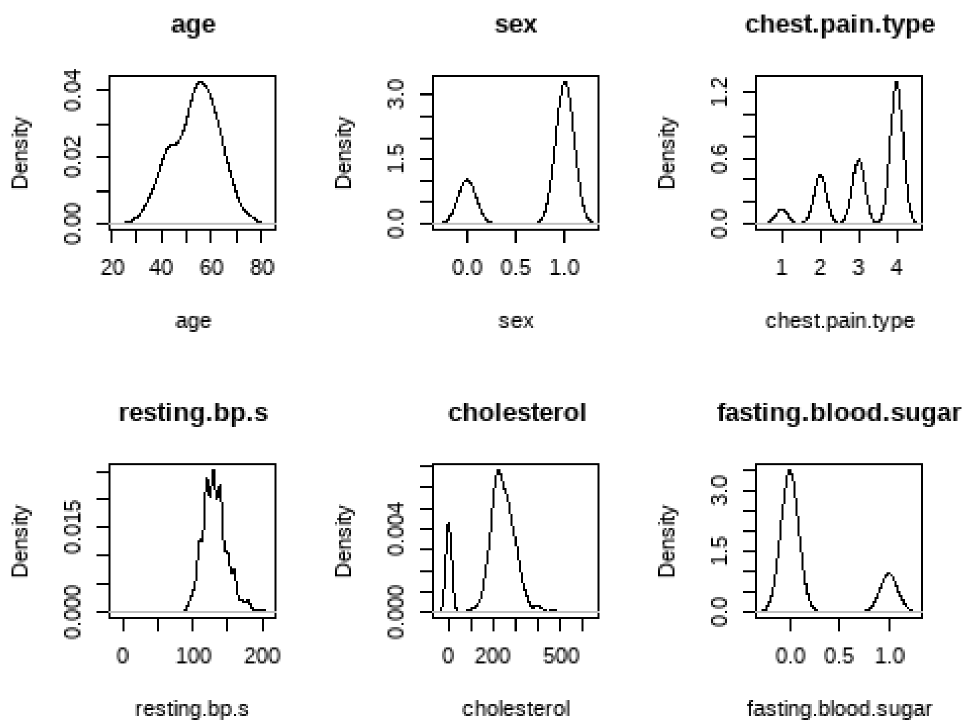



```
hist(heart[, 7], main = names(heart)[7], xlab = names(heart)[7], xlim =
c(0,100))
```

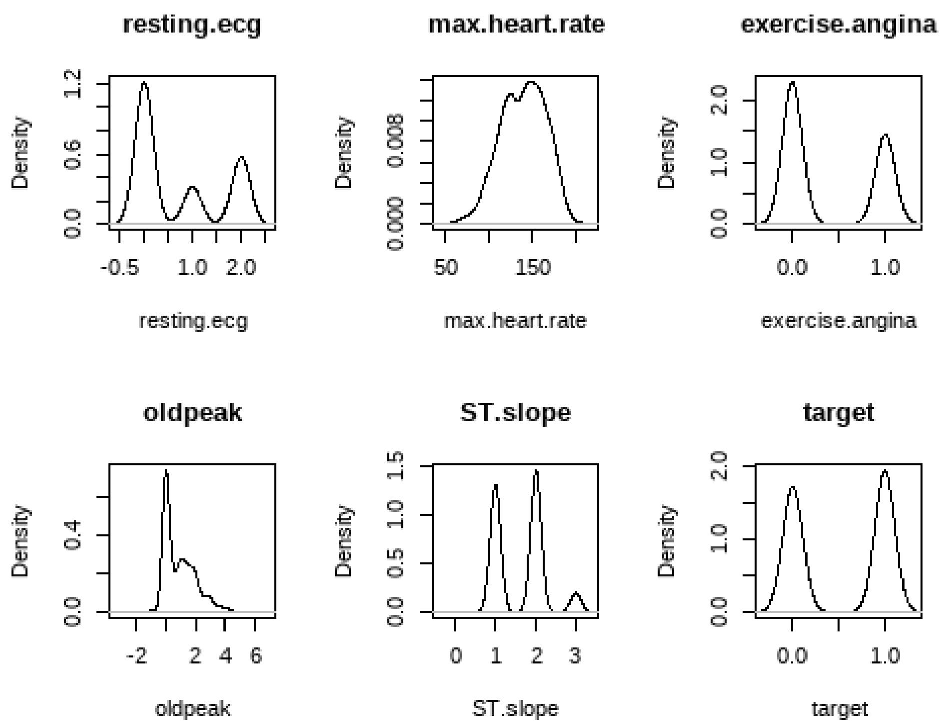
```
hist(heart[, 8], main = names(heart)[8], xlab = names(heart)[8], xlim =
c(0,100))
hist(heart[, 9], main = names(heart)[9], xlab = names(heart)[9], xlim =
c(0,100))
hist(heart[, 10], main = names(heart)[10], xlab = names(heart)[10], xlim =
c(0,100))
hist(heart[, 11], main = names(heart)[11], xlab = names(heart)[11], xlim =
c(0,100))
hist(heart[, 12], main = names(heart)[12], xlab = names(heart)[12], xlim =
c(0,100))
```



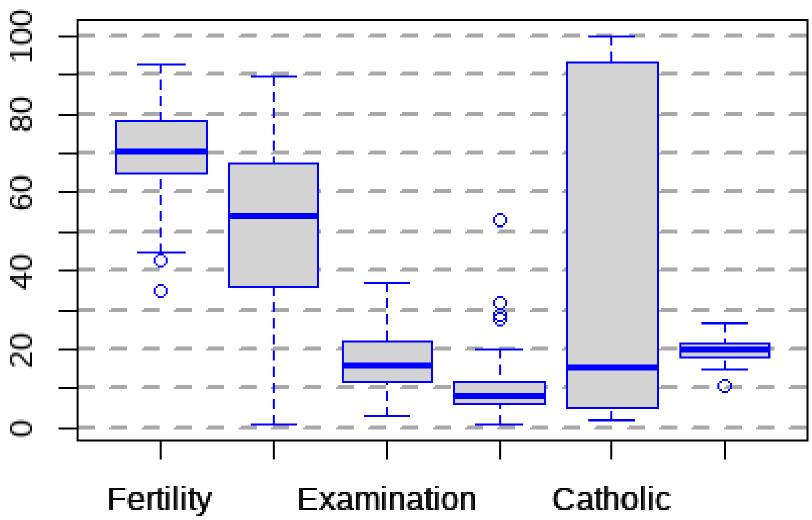

```
par(opar)

# generate a density plot for each variable (and show them on the same page)
#   note: kernel density estimation may have tails outside the variable
range!
opar <- par(no.readonly = TRUE)
par(mfrow = c(2,3))
plot(density(heart[, 1]), main = names(heart)[1], xlab = names(heart)[1])
plot(density(heart[, 2]), main = names(heart)[2], xlab = names(heart)[2])
plot(density(heart[, 3]), main = names(heart)[3], xlab = names(heart)[3])
plot(density(heart[, 4]), main = names(heart)[4], xlab = names(heart)[4])
plot(density(heart[, 5]), main = names(heart)[5], xlab = names(heart)[5])
plot(density(heart[, 6]), main = names(heart)[6], xlab = names(heart)[6])
```




```
plot(density(heart[, 7]), main = names(heart)[7], xlab = names(heart)[7])
plot(density(heart[, 8]), main = names(heart)[8], xlab = names(heart)[8])
plot(density(heart[, 9]), main = names(heart)[9], xlab = names(heart)[9])
plot(density(heart[, 10]), main = names(heart)[10], xlab = names(heart)[10])
plot(density(heart[, 11]), main = names(heart)[11], xlab = names(heart)[11])
plot(density(heart[, 12]), main = names(heart)[12], xlab = names(heart)[12])
```




```r
par(opar)

# generate a boxplot graph including horizontal background dashed lines
#   note: this can be done by
#     1. plotting an empty graph, i.e. with white boxes
#     2. adding the background dashed lines
#     3. plotting the coloured boxplot with the option add = T
opar <- par(no.readonly = TRUE)
boxplot(
  swiss,
  border = 'white',
  yaxt = 'n'
)
abline(h = seq(0,100,10), lty = 'dashed', lwd = 2, col = 'darkgrey')
boxplot(
  swiss,
  border = 'blue',
  yaxt = 'n',
  add = T
)
axis(2, seq(0,100,10))
```

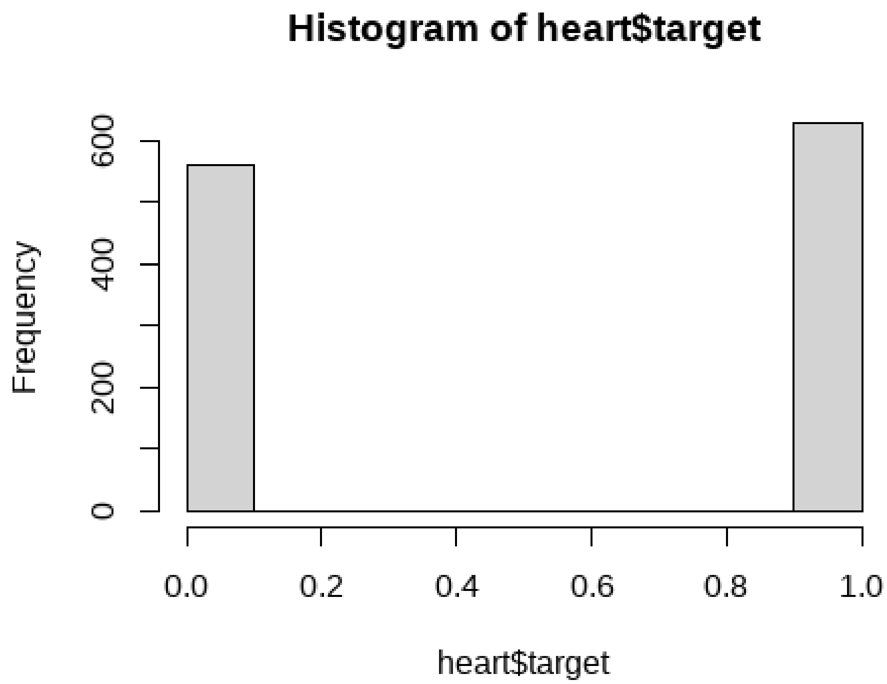



```
par(opar)
```

Age - positive skewness, Kurtosis none Sex - negative skewness Chest.pain.type - negative skewness Resting.bp.s - negative skewness Cholesterol - negative skewness Fasting.blood - positive skewness resting.ecg - positive skewness max.heart.rate - positive skewness exercise.agina - positive skewness oldpeak - negative skewness ST.slope - negative skewness target - negative skewness

The plots confirms that the ouliers do exist in the seven features mentioend above.

```
hist(heart$target)
```



Those suffering from heart disease is greater in numbers versus those that is not. I wonder will a gender analysis show. Looking at it below. For men there is a greater percentage of men having the disease than women.

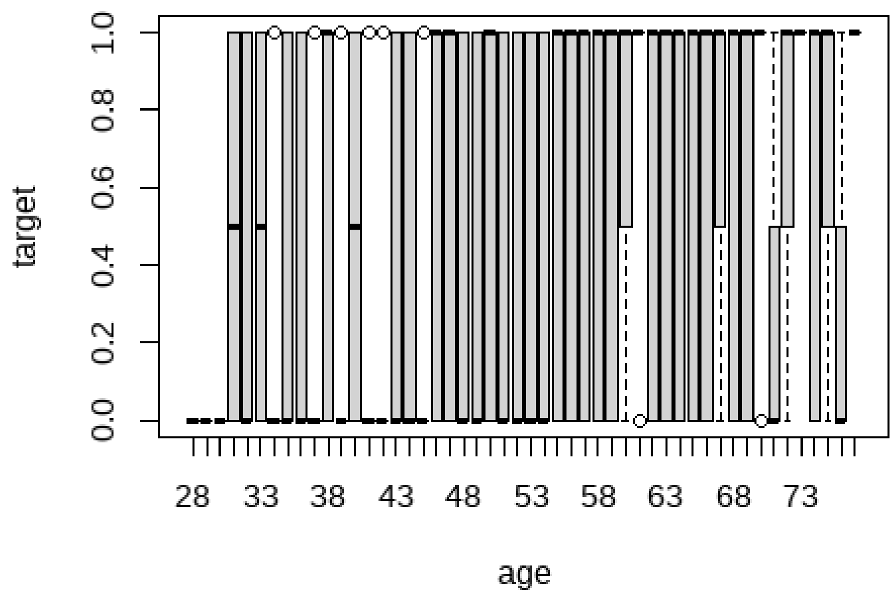
```
tabyl(heart, sex, target)

##  sex   0   1
##    0 211  70
##    1 350 559
```

Detecting missing/incorect data as identified in the variable cholesterol and identification of outliers.

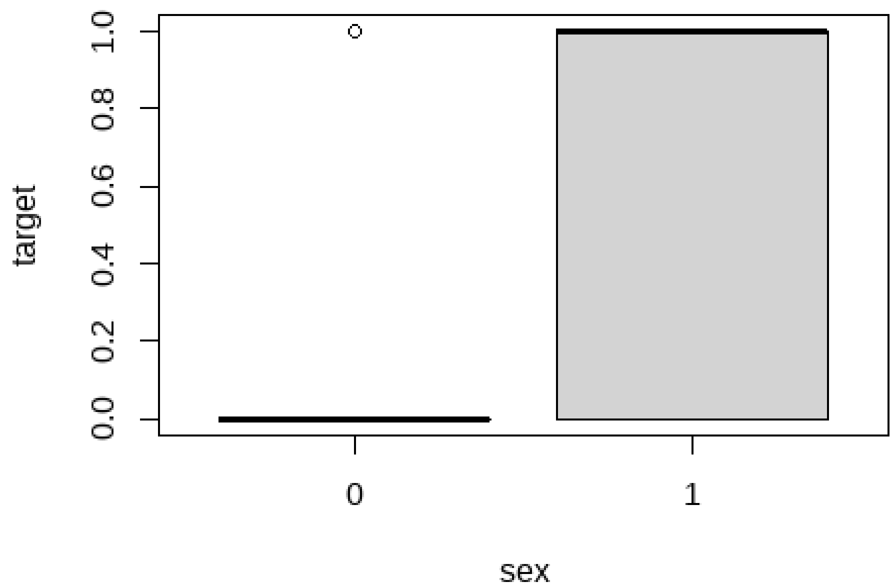
After cleaning the data

```
#  Identifying which values == 0 in this column
#  heart$cholesterol == 0 will give all values = 0 as True and the rest as
false.
#  Passing the above result to the column and replacing with NA
heart$cholesterol[heart$cholesterol == 0] <- NA
# Removing all instance of NA
heart_clean <- na.omit(heart)
# Check the size
dim(heart)

## [1] 1190   12
```

```r
dim(heart_clean)

## [1] 1018   12

boxplot(target ~ age, data = heart)
```

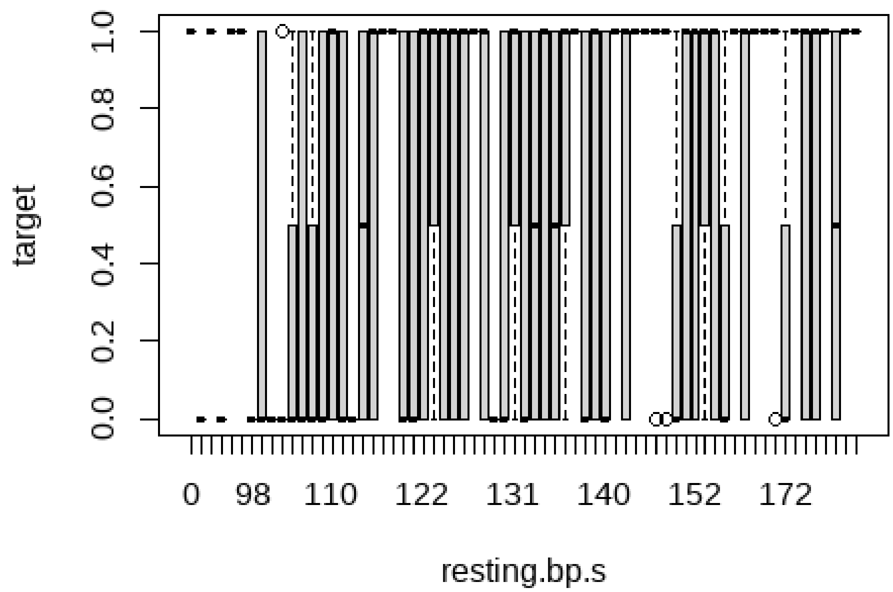



```r
boxplot(target ~ sex, data = heart)
```

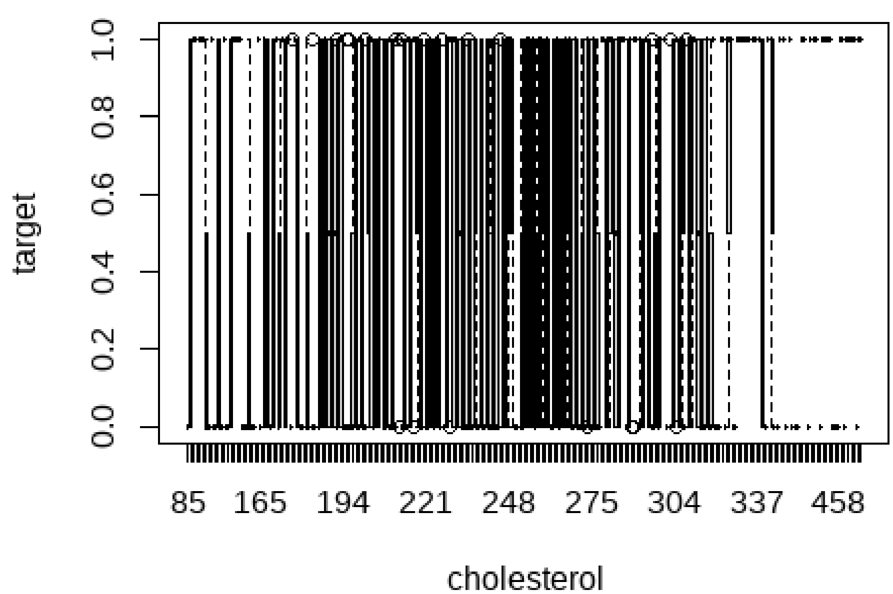



```
boxplot(target ~ chest.pain.type, data = heart)
```

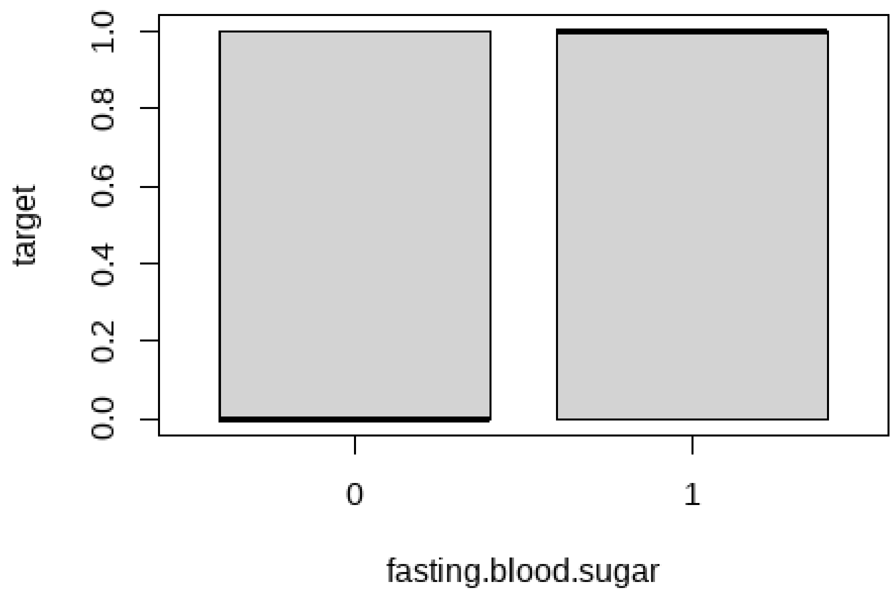

```
boxplot(target ~ resting.bp.s, data = heart)
```



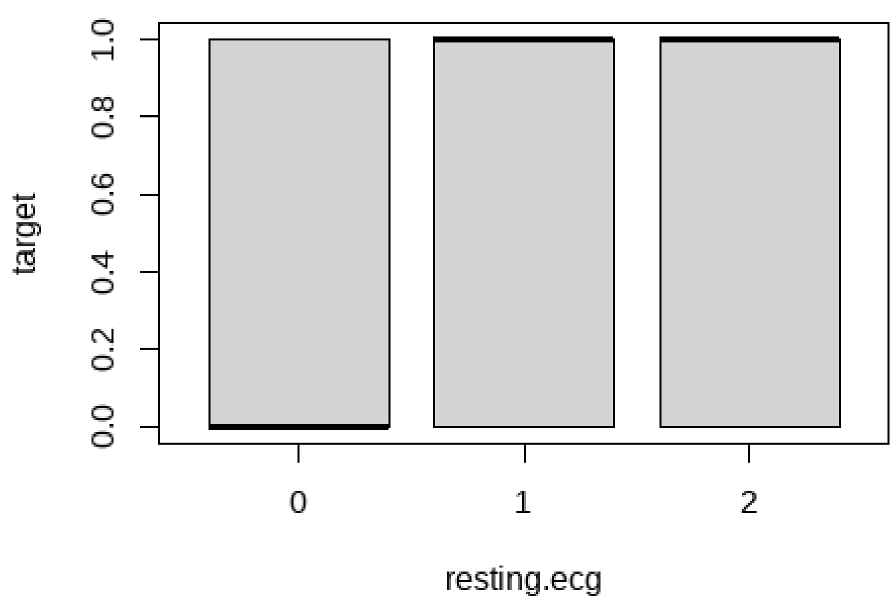

```r
boxplot(target ~ cholesterol, data = heart)
```



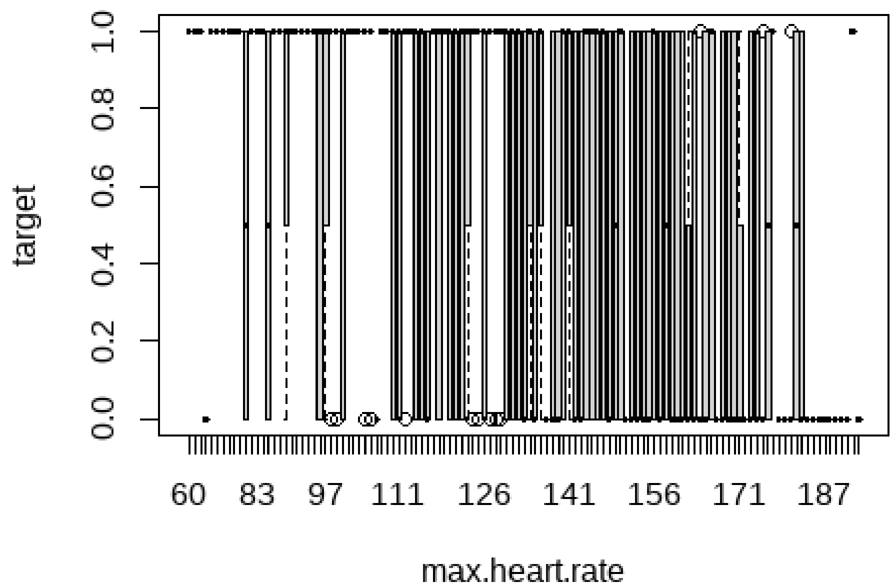

```r
boxplot(target ~ fasting.blood.sugar, data = heart)
```



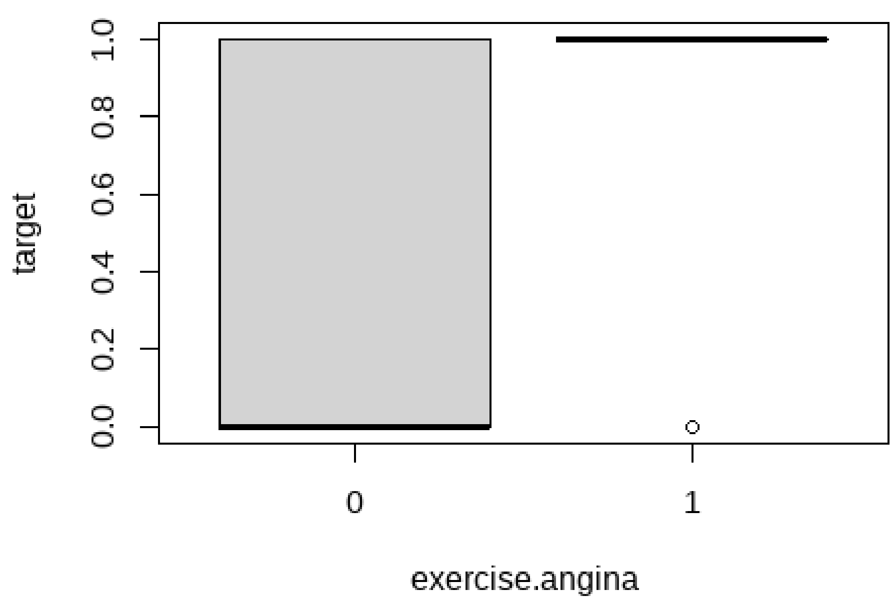

```
boxplot(target ~ resting.ecg, data = heart)
```



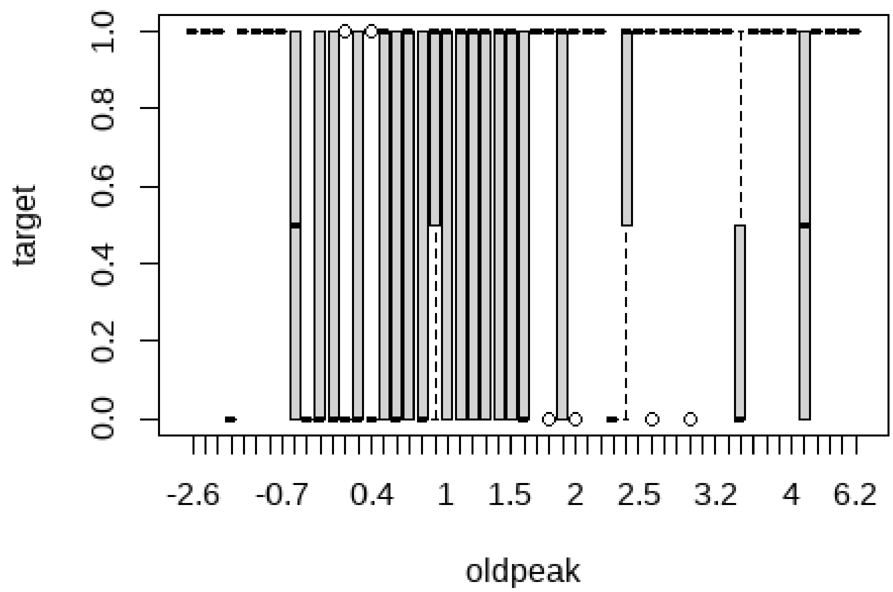

```
boxplot(target ~ max.heart.rate, data = heart)
```



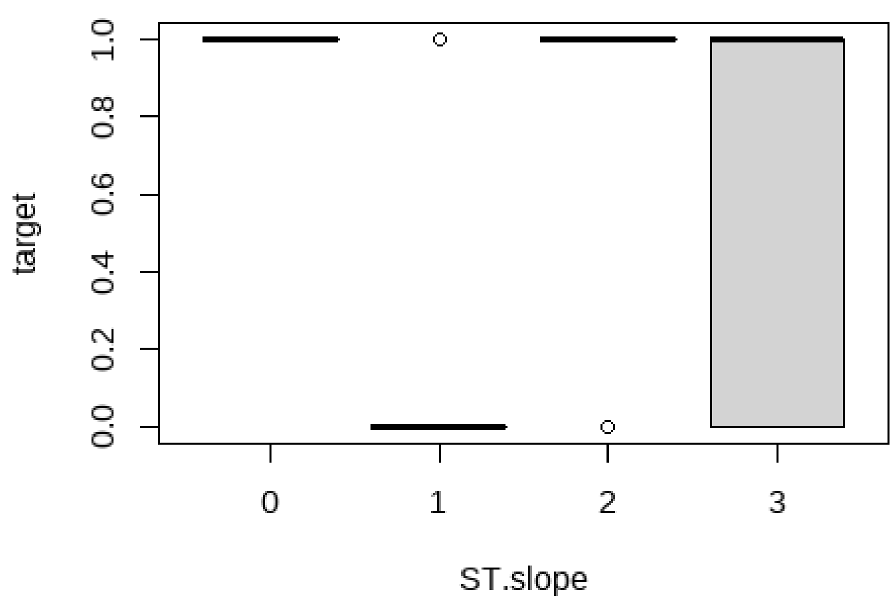

```r
boxplot(target ~ exercise.angina, data = heart)
```




```r
boxplot(target ~ oldpeak, data = heart)
```



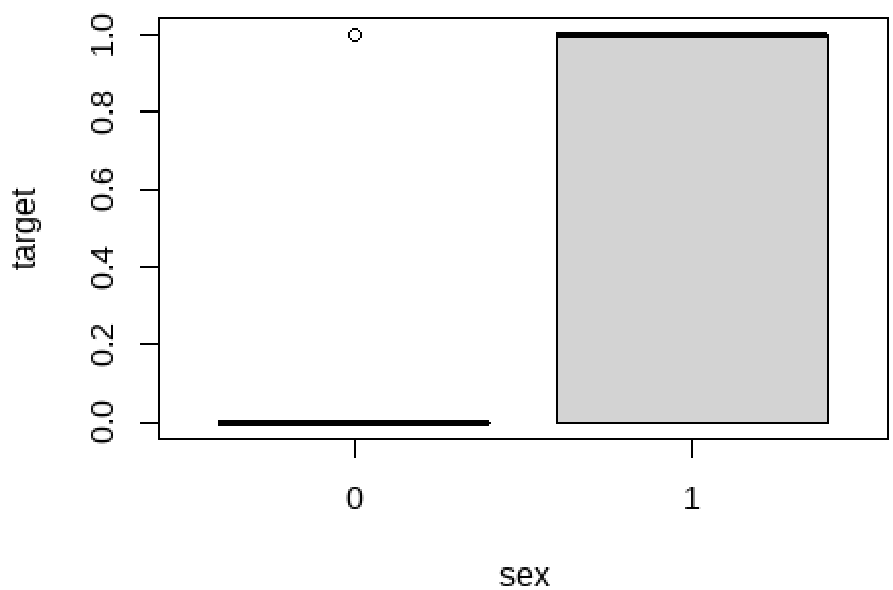

```
boxplot(target ~ ST.slope, data = heart)
```



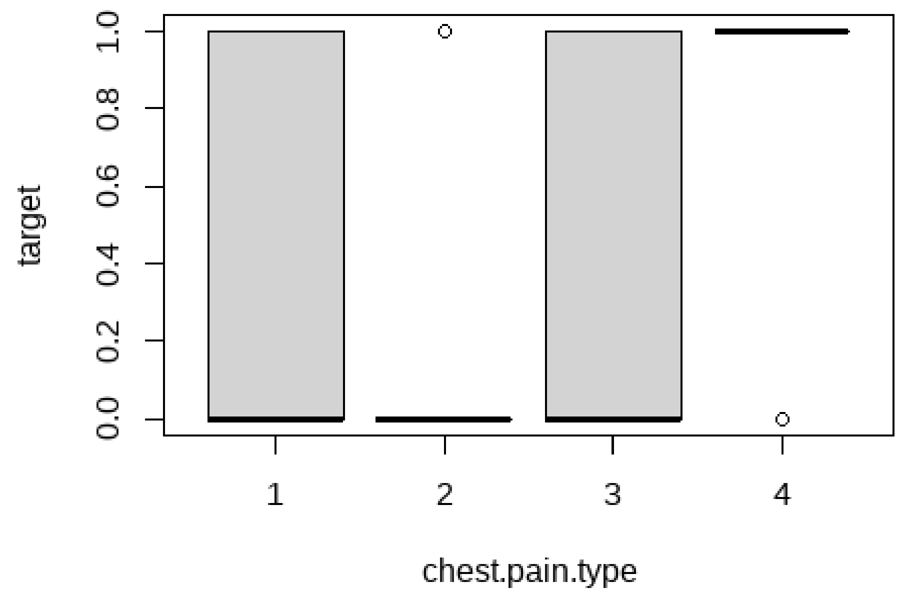
Boxplot analysis has confirm what numeric analysis table showed us and that is we have 7 variables with outliers. Variables with outliers include: * sex; * chest.pain.type * resting.bp.s * cholesterol * fasting.blood.sugar; * max heart.rate; * ST.slop

I have chosen to remove outliers as identified by the boxplot analysis.

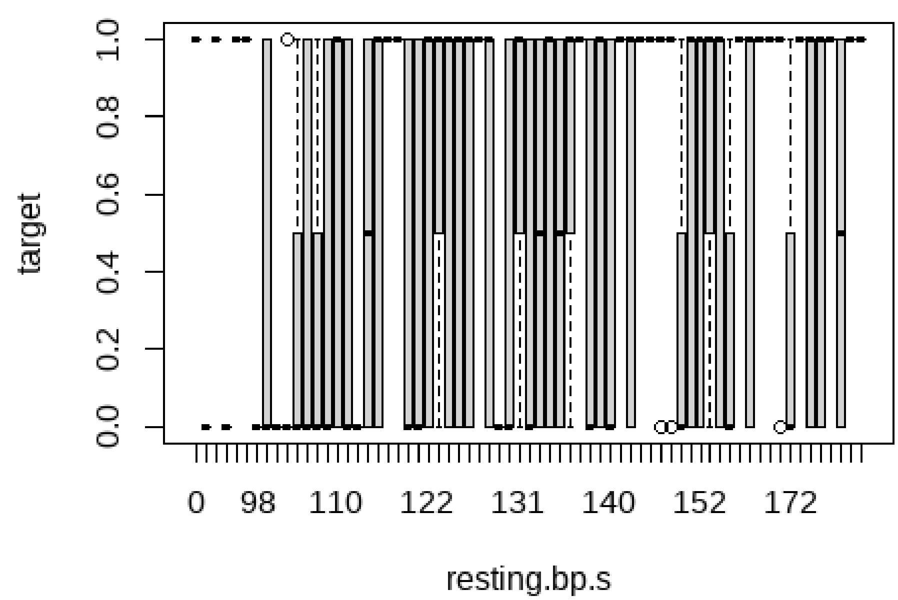
```
# outliers was detected above using boxplot
#   note: the boxplot command returns a summary statistics object
#     this object can be assigned to a variable and inspected
heart_sex_boxplot <-boxplot(target ~ sex, data = heart)
```



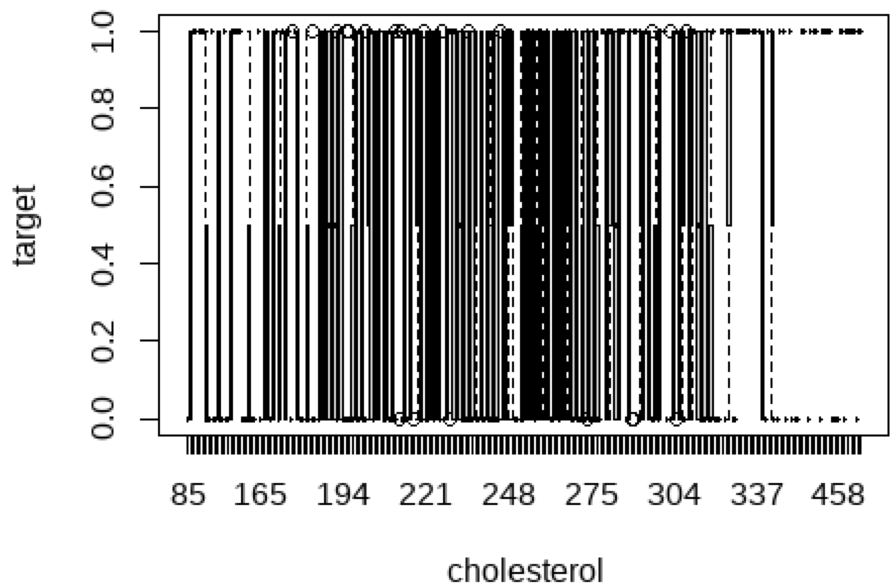

```
heart_cpt_boxplot <-boxplot(target ~ chest.pain.type, data = heart)
```



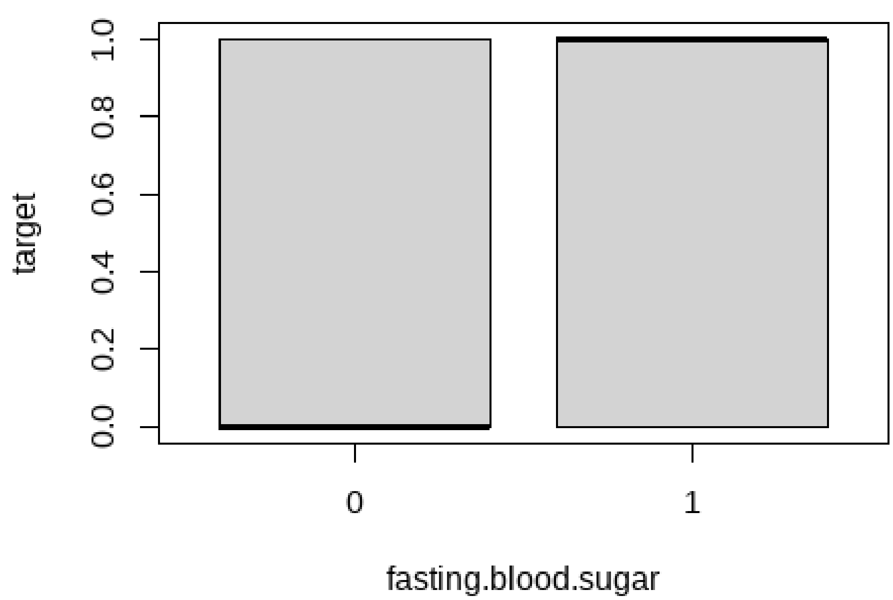

```
heart_rbps_boxplot <-boxplot(target ~ resting.bp.s, data = heart)
```



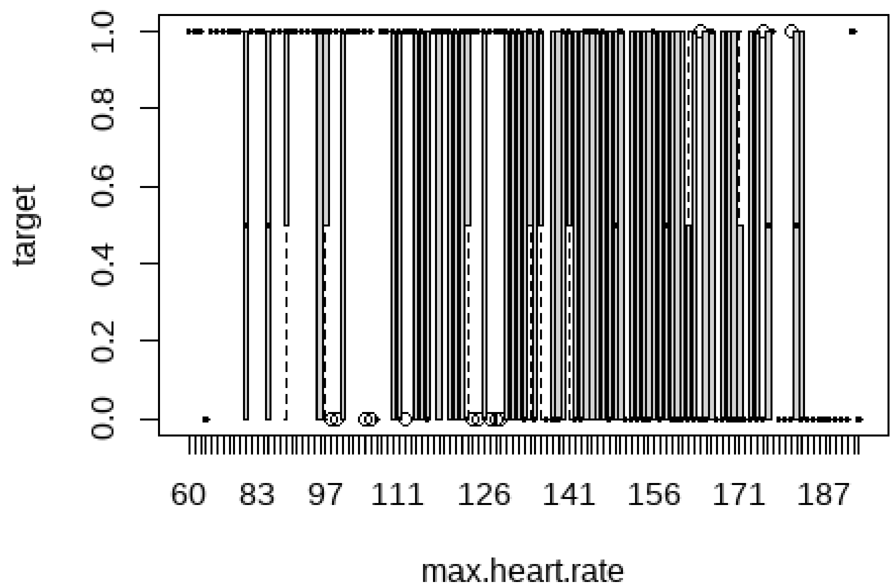

```
heart_chol_boxplot <-boxplot(target ~ cholesterol, data = heart)
```



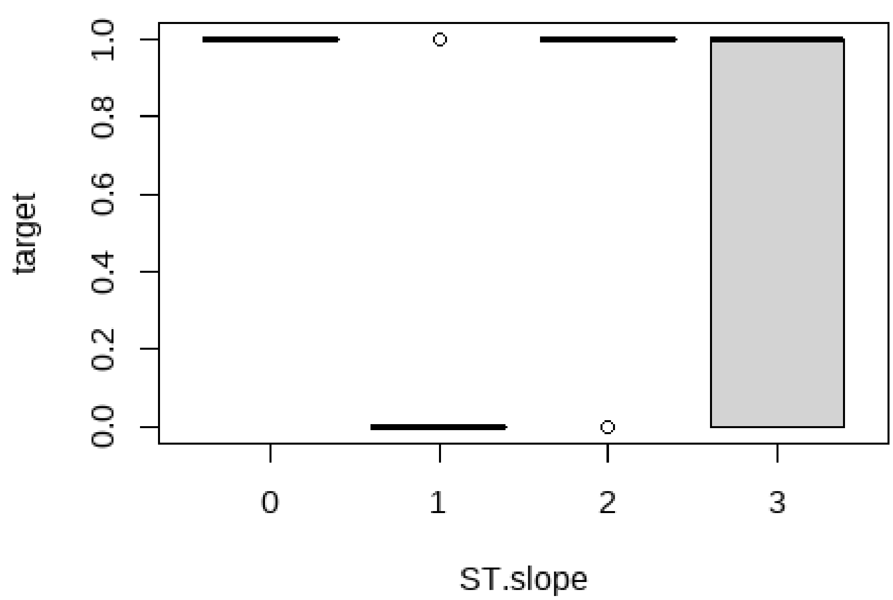

```
heart_fbs_boxplot <-boxplot(target ~ fasting.blood.sugar, data = heart)
```




```
heart_mhr_boxplot <-boxplot(target ~ max.heart.rate, data = heart)
```




```
heart_STs_boxplot <-boxplot(target ~ ST.slope, data = heart)
```



```
# inspect the boxplot statistics
#   note: the returened value is a list object
heart_sex_boxplot
```

```
## $stats
##      [,1] [,2]
## [1,]    0    0
## [2,]    0    0
## [3,]    0    1
## [4,]    0    1
## [5,]    0    1
## 
## $n
## [1] 281 909
## 
## $conf
##      [,1]      [,2]
## [1,]    0 0.9475947
## [2,]    0 1.0524053
## 
## $out
##  [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1
## [39] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## 
## $group
##  [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1
## [39] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## 
## $names
## [1] "0" "1"
```

```
heart_cpt_boxplot
```

```
## $stats
##      [,1] [,2] [,3] [,4]
## [1,]    0    0    0    1
## [2,]    0    0    0    1
## [3,]    0    0    0    1
## [4,]    1    0    1    1
## [5,]    1    0    1    1
## 
## $n
## [1]  66 216 283 625
## 
## $conf
##            [,1] [,2]        [,3] [,4]
## [1,] -0.1944846    0 -0.09392125    1
## [2,]  0.1944846    0  0.09392125    1
```

```
##
## $out
##   [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0
0 0 0
##  [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
##  [75] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
## [112] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
## [149] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
##
## $group
##   [1] 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 4 4 4
4 4 4
##  [38] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
4 4 4
##  [75] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
4 4 4
## [112] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
4 4 4
## [149] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
##
## $names
## [1] "1" "2" "3" "4"
```

```
heart_rbps_boxplot
```

```
## $stats
##      [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12] [,13]
[,14]
## [1,]    1    0    1    0    1    1    0    0    0     0   0.0     0   0.0
0
## [2,]    1    0    1    0    1    1    0    0    0     0   0.0     0   0.0
0
## [3,]    1    0    1    0    1    1    0    0    0     0   0.0     0   0.0
0
## [4,]    1    0    1    0    1    1    0    1    0     0   0.5     1   0.5
1
## [5,]    1    0    1    0    1    1    0    1    0     0   1.0     1   1.0
1
##      [,15] [,16] [,17] [,18] [,19] [,20] [,21] [,22] [,23] [,24] [,25]
[,26]
## [1,]     0     0     0   0.0     0     1     1     0     0     0   0.0
0
## [2,]     0     0     0   0.0     0     1     1     0     0     0   0.5
0
## [3,]     1     0     0   0.5     1     1     1     0     0     1   1.0
1
## [4,]     1     1     0   1.0     1     1     1     1     1     1   1.0
```

```
1
## [5,]     1     1     0   1.0     1     1     1     1     1     1   1.0
1
##      [,27] [,28] [,29] [,30] [,31] [,32] [,33] [,34] [,35] [,36] [,37]
[,38]
## [1,]     0     0     1     0     0     0   0.0     0   0.0     0   0.0
0.0
## [2,]     0     0     1     0     0     0   0.5     0   0.0     0   0.0
0.5
## [3,]     1     1     1     1     0     0   1.0     0   0.5     1   0.5
1.0
## [4,]     1     1     1     1     0     1   1.0     1   1.0     1   1.0
1.0
## [5,]     1     1     1     1     0     1   1.0     1   1.0     1   1.0
1.0
##      [,39] [,40] [,41] [,42] [,43] [,44] [,45] [,46] [,47] [,48] [,49]
[,50]
## [1,]     1     0     0     0     1     0     1     1     1     1   0.0
0
## [2,]     1     0     0     0     1     0     1     1     1     1   0.0
0
## [3,]     1     0     1     0     1     1     1     1     1     1   0.0
1
## [4,]     1     1     1     1     1     1     1     1     1     1   0.5
1
## [5,]     1     1     1     1     1     1     1     1     1     1   1.0
1
##      [,51] [,52] [,53] [,54] [,55] [,56] [,57] [,58] [,59] [,60] [,61]
[,62]
## [1,]     0   0.0     0   0.0     1     0     1     1     1   0.0     1
0
## [2,]     0   0.5     0   0.0     1     0     1     1     1   0.0     1
0
## [3,]     1   1.0     1   0.0     1     1     1     1     1   0.0     1
1
## [4,]     1   1.0     1   0.5     1     1     1     1     1   0.5     1
1
## [5,]     1   1.0     1   1.0     1     1     1     1     1   1.0     1
1
##      [,63] [,64] [,65] [,66] [,67]
## [1,]     0     1   0.0     1     1
## [2,]     0     1   0.0     1     1
## [3,]     1     1   0.5     1     1
## [4,]     1     1   1.0     1     1
## [5,]     1     1   1.0     1     1
## 
## $n
##  [1]   1   1   1   4   6   1   1  19   2   5   4  12   4  13  76  23   1
2  22
## [20]   2   2  17 166  15   3  17  39  10   1  27   2 149   4  23   6  15
```

```
26  16
## [39]   5  26   5 137   3  14   2   9  23   5   3  73  11   3   9   3   5
61   1
## [58]   3  16   3   2   5  15   1   2   2   5
##
## $conf
##      [,1] [,2] [,3] [,4] [,5] [,6] [,7]       [,8] [,9] [,10]  [,11]
[,12]
## [1,]    1    0    1    0    1    1    0 -0.3624769    0     0 -0.395 -
0.4561067
## [2,]    1    0    1    0    1    1    0  0.3624769    0     0  0.395
0.4561067
##       [,13]      [,14]     [,15]      [,16] [,17]      [,18]     [,19]
[,20]
## [1,] -0.395 -0.4382132 0.8187616 -0.3294528     0 -0.6172287 0.6631429
1
## [2,]  0.395  0.4382132 1.1812384  0.3294528     0  1.6172287 1.3368571
1
##      [,21]      [,22]      [,23]     [,24]     [,25]     [,26]     [,27]
## [1,]     1 -0.3832063 -0.1226318 0.5920458 0.5438933 0.6167937 0.7469975
## [2,]     1  0.3832063  0.1226318 1.4079542 1.4561067 1.3832063 1.2530025
##          [,28] [,29]     [,30] [,31]      [,32] [,33]      [,34]
[,35]
## [1,] 0.5003601     1 0.6959289     0 -0.1294386 0.605 -0.3294528 -
0.1450323
## [2,] 1.4996399     1 1.3040711     0  0.1294386 1.395  0.3294528
1.1450323
##          [,36]     [,37]  [,38] [,39]      [,40]     [,41]      [,42]
[,43]
## [1,] 0.5920458 0.1901365 0.8025     1 -0.3098635 0.2934025 -0.1349885
1
## [2,] 1.4079542 0.8098635 1.1975     1  0.3098635 1.7065975  0.1349885
1
##          [,44] [,45] [,46] [,47] [,48]      [,49]    [,50]     [,51]
[,52]
## [1,] 0.5777272     1     1     1     1 -0.4561067 0.815075 0.5236121
0.5438933
## [2,] 1.4222728     1     1     1     1  0.4561067 1.184925 1.4763879
1.4561067
##          [,53]      [,54] [,55]     [,56] [,57] [,58] [,59]      [,60]
[,61]
## [1,] 0.4733333 -0.4561067     1 0.7977017     1     1     1 -0.4561067
1
## [2,] 1.5266667  0.4561067     1 1.2022983     1     1     1  0.4561067
1
##          [,62]     [,63] [,64]      [,65] [,66] [,67]
## [1,] 0.2934025 0.5920458     1 -0.6172287     1     1
## [2,] 1.7065975 1.4079542     1  1.6172287     1     1
##
## $out
```

```
## [1] 1 0 0 0 0 0 0 0 0
##
## $group
## [1] 10 47 47 47 47 48 59 59 59
##
## $names
##  [1] "0"   "80"  "92"  "94"  "95"  "96"  "98"  "100" "101" "102" "104"
"105"
## [13] "106" "108" "110" "112" "113" "114" "115" "116" "117" "118" "120"
"122"
## [25] "123" "124" "125" "126" "127" "128" "129" "130" "131" "132" "133"
"134"
## [37] "135" "136" "137" "138" "139" "140" "141" "142" "143" "144" "145"
"146"
## [49] "148" "150" "152" "154" "155" "156" "158" "160" "164" "165" "170"
"172"
## [61] "174" "178" "180" "185" "190" "192" "200"
```

```
heart_chol_boxplot
```

```
## $stats
##      [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12] [,13]
[,14]
## [1,]    0  0.0    1    1    1    1  0.0    0    1     0   0.0     0     1
0
## [2,]    0  0.0    1    1    1    1  0.0    0    1     0   0.0     0     1
0
## [3,]    0  0.5    1    1    1    1  0.0    0    1     0   0.5     0     1
0
## [4,]    0  1.0    1    1    1    1  0.5    0    1     0   1.0     0     1
0
## [5,]    0  1.0    1    1    1    1  1.0    0    1     0   1.0     0     1
0
##      [,15] [,16] [,17] [,18] [,19] [,20] [,21] [,22] [,23] [,24] [,25]
[,26]
## [1,]   0.0     1     1     1     0     0   0.0     0     0     1     0
0
## [2,]   0.0     1     1     1     0     0   0.0     0     0     1     0
0
## [3,]   0.5     1     1     1     0     0   0.0     0     0     1     0
1
## [4,]   1.0     1     1     1     0     0   0.5     0     0     1     0
1
## [5,]   1.0     1     1     1     0     0   1.0     0     0     1     0
1
##      [,27] [,28] [,29] [,30] [,31] [,32] [,33] [,34] [,35] [,36] [,37]
[,38]
## [1,]   0.0     0   0.0     1   0.0     1   0.0     1     0     1   0.0
0
## [2,]   0.0     0   0.0     1   0.0     1   0.0     1     0     1   0.0
```

```
0
## [3,]   0.5     0   0.5     1   0.0     1   0.5     1     0     1   0.5
0
## [4,]   1.0     0   1.0     1   0.5     1   1.0     1     0     1   1.0
0
## [5,]   1.0     0   1.0     1   1.0     1   1.0     1     0     1   1.0
0
##      [,39] [,40] [,41] [,42] [,43] [,44] [,45] [,46] [,47] [,48] [,49]
[,50]
## [1,]     0   0.0     0     0     0     0   0.0     0   0.0     0   0.0
0
## [2,]     0   0.0     0     0     0     0   0.0     0   0.0     0   0.0
0
## [3,]     0   0.0     0     0     0     0   0.5     1   0.5     1   0.5
0
## [4,]     0   0.5     0     0     0     1   1.0     1   1.0     1   1.0
0
## [5,]     0   1.0     0     0     0     1   1.0     1   1.0     1   1.0
0
##      [,51] [,52] [,53] [,54] [,55] [,56] [,57] [,58] [,59] [,60] [,61]
[,62]
## [1,]     0     0     0     0   0.0   0.0     0     0     0   0.0     0
0
## [2,]     0     0     0     0   0.0   0.0     0     0     0   0.5     0
0
## [3,]     1     0     0     0   0.0   0.5     0     1     0   1.0     1
0
## [4,]     1     0     0     0   0.5   1.0     0     1     0   1.0     1
1
## [5,]     1     0     0     0   1.0   1.0     0     1     0   1.0     1
1
##      [,63] [,64] [,65] [,66] [,67] [,68] [,69] [,70] [,71] [,72] [,73]
[,74]
## [1,]   0.0     1     0     0     0     0     0     1     0     0     0
0
## [2,]   0.0     1     0     0     0     0     0     1     0     0     0
0
## [3,]   0.5     1     0     0     0     0     0     1     0     0     0
1
## [4,]   1.0     1     1     1     0     1     0     1     0     1     0
1
## [5,]   1.0     1     1     1     0     1     0     1     0     1     0
1
##      [,75] [,76] [,77] [,78] [,79] [,80] [,81] [,82] [,83] [,84] [,85]
[,86]
## [1,]     1   0.0   0.0     0     0     0   0.0     0     0     0     0
0
## [2,]     1   0.5   0.0     0     0     0   0.0     0     0     0     0
0
## [3,]     1   1.0   0.5     0     0     0   0.5     0     1     0     0
```

```
1
## [4,]     1   1.0   1.0     0     1     1   1.0     1     1     0     0
1
## [5,]     1   1.0   1.0     0     1     1   1.0     1     1     0     0
1
##      [,87] [,88] [,89] [,90] [,91] [,92] [,93] [,94] [,95] [,96] [,97]
[,98]
## [1,]     1     0   0.0   0.0     0     0     0     0   0.0     0   0.0
0
## [2,]     1     0   0.5   0.0     0     0     0     0   0.5     0   0.0
0
## [3,]     1     1   1.0   0.5     0     0     0     0   1.0     0   0.5
0
## [4,]     1     1   1.0   1.0     1     1     0     1   1.0     0   1.0
0
## [5,]     1     1   1.0   1.0     1     1     0     1   1.0     0   1.0
0
##      [,99] [,100] [,101] [,102] [,103] [,104] [,105] [,106] [,107] [,108]
## [1,]   0.0    0.0      0      0      0      0    0.0    0.0    0.0      0
## [2,]   0.0    0.0      0      0      0      0    0.0    0.5    0.5      0
## [3,]   0.5    0.0      0      0      0      1    0.5    1.0    1.0      0
## [4,]   1.0    0.5      1      1      0      1    1.0    1.0    1.0      0
## [5,]   1.0    1.0      1      1      0      1    1.0    1.0    1.0      0
##      [,109] [,110] [,111] [,112] [,113] [,114] [,115] [,116] [,117] [,118]
## [1,]      0    0.0      0      0      0      0    0.0      0    0.0    0.0
## [2,]      0    0.0      0      0      0      0    0.0      0    0.5    0.0
## [3,]      0    0.0      0      1      1      1    0.0      1    1.0    0.5
## [4,]      0    0.5      1      1      1      1    0.5      1    1.0    1.0
## [5,]      0    1.0      1      1      1      1    1.0      1    1.0    1.0
##      [,119] [,120] [,121] [,122] [,123] [,124] [,125] [,126] [,127] [,128]
## [1,]      0      0      0      0      0    0.0    0.0      0      0      0
## [2,]      0      0      0      0      0    0.0    0.5      0      0      0
## [3,]      1      0      0      1      0    0.5    1.0      1      0      1
## [4,]      1      0      1      1      1    1.0    1.0      1      1      1
## [5,]      1      0      1      1      1    1.0    1.0      1      1      1
##      [,129] [,130] [,131] [,132] [,133] [,134] [,135] [,136] [,137] [,138]
## [1,]      0    0.0      0      1      0      0    0.0      0      1    0.0
## [2,]      0    0.0      0      1      0      0    0.0      0      1    0.0
## [3,]      0    0.0      0      1      0      1    0.0      0      1    0.5
## [4,]      0    0.5      1      1      1      1    0.5      0      1    1.0
## [5,]      0    1.0      1      1      1      1    1.0      0      1    1.0
##      [,139] [,140] [,141] [,142] [,143] [,144] [,145] [,146] [,147] [,148]
## [1,]    0.0      1    0.0      0      1      1    0.0      1      1      1
## [2,]    0.5      1    0.0      0      1      1    0.0      1      1      1
## [3,]    1.0      1    0.5      1      1      1    0.5      1      1      1
## [4,]    1.0      1    1.0      1      1      1    1.0      1      1      1
## [5,]    1.0      1    1.0      1      1      1    1.0      1      1      1
##      [,149] [,150] [,151] [,152] [,153] [,154] [,155] [,156] [,157] [,158]
## [1,]    0.0    0.0      1    0.0      0    0.0      0      1      1      0
## [2,]    0.5    0.0      1    0.0      0    0.0      0      1      1      0
```

```
## [3,]    1.0    0.5      1    0.5      0    0.0      0      1      1      0
## [4,]    1.0    1.0      1    1.0      0    0.5      1      1      1      0
## [5,]    1.0    1.0      1    1.0      0    1.0      1      1      1      0
##      [,159] [,160] [,161] [,162] [,163] [,164] [,165] [,166] [,167] [,168]
## [1,]      0    0.0      1    0.0    0.0      0      0    0.0      1    0.0
## [2,]      0    0.0      1    0.0    0.5      0      0    0.5      1    0.0
## [3,]      0    0.5      1    0.5    1.0      0      1    1.0      1    0.5
## [4,]      0    1.0      1    1.0    1.0      0      1    1.0      1    1.0
## [5,]      0    1.0      1    1.0    1.0      0      1    1.0      1    1.0
##      [,169] [,170] [,171] [,172] [,173] [,174] [,175] [,176] [,177] [,178]
## [1,]      0      0      1    0.0      1      0      0      1      0    0.0
## [2,]      0      0      1    0.0      1      0      0      1      0    0.5
## [3,]      0      0      1    0.0      1      0      0      1      0    1.0
## [4,]      0      1      1    0.5      1      0      0      1      0    1.0
## [5,]      0      1      1    1.0      1      0      0      1      0    1.0
##      [,179] [,180] [,181] [,182] [,183] [,184] [,185] [,186] [,187] [,188]
## [1,]      1      0      1      1      1      1      1      1      1      1
## [2,]      1      0      1      1      1      1      1      1      1      1
## [3,]      1      0      1      1      1      1      1      1      1      1
## [4,]      1      0      1      1      1      1      1      1      1      1
## [5,]      1      0      1      1      1      1      1      1      1      1
##      [,189] [,190] [,191] [,192] [,193] [,194] [,195] [,196] [,197] [,198]
## [1,]    0.0      0      1    0.0      0      0      1      1      0      1
## [2,]    0.0      0      1    0.5      0      0      1      1      0      1
## [3,]    0.5      0      1    1.0      0      0      1      1      0      1
## [4,]    1.0      0      1    1.0      0      0      1      1      0      1
## [5,]    1.0      0      1    1.0      0      0      1      1      0      1
##      [,199] [,200] [,201] [,202] [,203] [,204] [,205] [,206] [,207] [,208]
## [1,]      0      0      0      1      1      0      1      1      1      0
## [2,]      0      0      0      1      1      0      1      1      1      0
## [3,]      0      0      0      1      1      0      1      1      1      0
## [4,]      0      0      0      1      1      0      1      1      1      0
## [5,]      0      0      0      1      1      0      1      1      1      0
##      [,209] [,210] [,211] [,212] [,213] [,214] [,215] [,216] [,217] [,218]
## [1,]      1      1      1      0      0      0      1      0      1      1
## [2,]      1      1      1      0      0      0      1      0      1      1
## [3,]      1      1      1      0      0      0      1      0      1      1
## [4,]      1      1      1      0      0      0      1      0      1      1
## [5,]      1      1      1      0      0      0      1      0      1      1
##      [,219] [,220] [,221]
## [1,]      1      0      1
## [2,]      1      0      1
## [3,]      1      0      1
## [4,]      1      0      1
## [5,]      1      0      1
##
## $n
##   [1]  1  2  1  1  1  1  3  1  1  1  2  2  1  2  4  1  1  1  1  1  7  2  2
3  1
##  [26]  5  4  3  2  2  3  3  2  2  5  1 10  2  2  4  2  6  2  5  4  7  2  6
```

```
2  5
##  [51]  7  2  8  8 11  8  6  5  9  3  9 13  4  5  8 10  7  5 13 10  9  9  7
10  5
##  [76]  8 12 11  6  8 12  7  8 10  5  7  7 12  8  4 10 13  7  8  7  4  8 11
4  3
## [101] 11  7  9 11  4  8  8  8  1  4  5 16  5  8  4 10  3 10  5  2 11  7  6
6  7
## [126]  7 11  8  6  3  7  9  9  5  7  1  1  2  4 11  8  5  2  4  2  9  8  3
3  4
## [151]  2  6  7  4  7  4  3  4  7  4  6  4  3  8  7  3  3  2  2  5  1  4  2
2  2
## [176]  2  4  3  2  1  1  4  1  1  3  1  1  1  2  3  4  3  1  1  1  2  2  1
1  2
## [201]  1  1  1  1  1  1  1  3  1  2  2  1  2  1  1  1  1  1  1  2  1
##
## $conf
##      [,1]       [,2] [,3] [,4] [,5] [,6]       [,7] [,8] [,9] [,10]
[,11]
## [1,]    0 -0.6172287    1    1    1    1 -0.4561067    0    1     0 -
0.6172287
## [2,]    0  1.6172287    1    1    1    1  0.4561067    0    1     0
1.6172287
##      [,12] [,13] [,14] [,15] [,16] [,17] [,18] [,19] [,20]      [,21]
[,22]
## [1,]     0     1     0 -0.29     1     1     1     0     0 -0.2985919
0
## [2,]     0     1     0  1.29     1     1     1     0     0  0.2985919
0
##      [,23] [,24] [,25]     [,26] [,27] [,28]      [,29] [,30]      [,31]
[,32]
## [1,]     0     1     0 0.2934025 -0.29     0 -0.6172287     1 -0.4561067
1
## [2,]     0     1     0 1.7065975  1.29     0  1.6172287     1  0.4561067
1
##           [,33] [,34] [,35] [,36]        [,37] [,38] [,39]  [,40] [,41]
[,42]
## [1,] -0.6172287     1     0     1 0.0003601297     0     0 -0.395     0
0
## [2,]  1.6172287     1     0     1 0.9996398703     0     0  0.395     0
0
##      [,43]      [,44] [,45]     [,46]      [,47]     [,48]      [,49]
[,50]
## [1,]     0 -0.7065975 -0.29 0.4028161 -0.6172287 0.3549677 -0.6172287
0
## [2,]     0  0.7065975  1.29 1.5971839  1.6172287 1.6450323  1.6172287
0
##          [,51] [,52] [,53] [,54]     [,55]       [,56] [,57]     [,58]
[,59]
## [1,] 0.4028161     0     0     0 -0.238194 -0.05861436     0 0.2934025
0
```

```
## [2,] 1.5971839     0     0     0  0.238194  1.05861436     0 1.7065975
0
##          [,60]     [,61]      [,62] [,63] [,64]      [,65]      [,66]
[,67]
## [1,] 0.5438933 0.4733333 -0.4382132 -0.29     1 -0.5586144 -0.4996399
0
## [2,] 1.4561067 1.5266667  0.4382132  1.29     1  0.5586144  0.4996399
0
##           [,68] [,69] [,70] [,71]      [,72] [,73]     [,74] [,75]
[,76]
## [1,] -0.7065975     0     1     0 -0.5266667     0 0.5003601     1
0.7206928
## [2,]  0.7065975     0     1     0  0.5266667     0 1.4996399     1
1.2793072
##           [,77] [,78]      [,79]      [,80]      [,81]      [,82]
[,83]
## [1,] 0.04389329     0 -0.6450323 -0.5586144 0.04389329 -0.5971839
0.4413856
## [2,] 0.95610671     0  0.6450323  0.5586144 0.95610671  0.5971839
1.5586144
##      [,84] [,85]     [,86] [,87]     [,88]     [,89] [,90]      [,91]
## [1,]     0     0 0.4028161     1 0.5438933 0.7206928 -0.29 -0.4996399
## [2,]     0     0 1.5971839     1 1.4561067 1.2793072  1.29  0.4996399
##           [,92] [,93]      [,94]     [,95] [,96]       [,97] [,98] [,99]
## [1,] -0.4382132     0 -0.5586144 0.7014081     0 -0.05861436     0 -0.29
## [2,]  0.4382132     0  0.5586144 1.2985919     0  1.05861436     0  1.29
##          [,100]     [,101]     [,102] [,103]    [,104] [,105]    [,106]
## [1,] -0.4561067 -0.4763879 -0.5971839      0 0.5236121  -0.29 0.7206928
## [2,]  0.4561067  0.4763879  0.5971839      0 1.4763879   1.29 1.2793072
##         [,107] [,108] [,109] [,110]     [,111] [,112]    [,113]    [,114]
## [1,] 0.7206928      0      0 -0.395 -0.7065975  0.605 0.2934025 0.4413856
## [2,] 1.2793072      0      0  0.395  0.7065975  1.395 1.7065975 1.5586144
##      [,115]    [,116]    [,117]       [,118]    [,119] [,120]     [,121]
## [1,] -0.395 0.5003601 0.5438933 0.0003601297 0.2934025      0 -0.4763879
## [2,]  0.395 1.4996399 1.4561067 0.9996398703 1.7065975      0  0.4763879
##         [,122]     [,123]     [,124]    [,125]    [,126]     [,127]
[,128]
## [1,] 0.4028161 -0.6450323 -0.1450323 0.7014081 0.4028161 -0.4763879
0.4413856
## [2,] 1.5971839  0.6450323  1.1450323 1.2985919 1.5971839  0.4763879
1.5586144
##      [,129]     [,130]     [,131] [,132]     [,133]    [,134]     [,135]
[,136]
## [1,]      0 -0.4561067 -0.5971839      1 -0.5266667 0.2934025 -0.2985919
0
## [2,]      0  0.4561067  0.5971839      1  0.5266667 1.7065975  0.2985919
0
##      [,137]     [,138] [,139] [,140]      [,141]    [,142] [,143] [,144]
## [1,]      1 -0.6172287  0.605      1 -0.05861436 0.2934025      1      1
## [2,]      1  1.6172287  1.395      1  1.05861436 1.7065975      1      1
```

```
##          [,145] [,146] [,147] [,148]    [,149] [,150] [,151]     [,152]
[,153]
## [1,] -0.6172287      1      1      1 0.5438933  -0.29      1 -0.1450323
0
## [2,]  1.6172287      1      1      1 1.4561067   1.29      1  1.1450323
0
##      [,154]     [,155] [,156] [,157] [,158] [,159] [,160] [,161] [,162]
## [1,] -0.395 -0.5971839      1      1      0      0  -0.29      1  -0.29
## [2,]  0.395  0.5971839      1      1      0      0   1.29      1   1.29
##         [,163] [,164]    [,165]    [,166] [,167]     [,168] [,169]
[,170]
## [1,] 0.5438933      0 0.4028161 0.5438933      1 -0.6172287      0 -
0.7065975
## [2,] 1.4561067      0 1.5971839 1.4561067      1  1.6172287      0
0.7065975
##      [,171] [,172] [,173] [,174] [,175] [,176] [,177]    [,178] [,179]
[,180]
## [1,]      1 -0.395      1      0      0      1      0 0.5438933      1
0
## [2,]      1  0.395      1      0      0      1      0 1.4561067      1
0
##      [,181] [,182] [,183] [,184] [,185] [,186] [,187] [,188]     [,189]
[,190]
## [1,]      1      1      1      1      1      1      1      1 -0.6172287
0
## [2,]      1      1      1      1      1      1      1      1  1.6172287
0
##      [,191]    [,192] [,193] [,194] [,195] [,196] [,197] [,198] [,199]
[,200]
## [1,]      1 0.5438933      0      0      1      1      0      1      0
0
## [2,]      1 1.4561067      0      0      1      1      0      1      0
0
##      [,201] [,202] [,203] [,204] [,205] [,206] [,207] [,208] [,209] [,210]
## [1,]      0      1      1      0      1      1      1      0      1      1
## [2,]      0      1      1      0      1      1      1      0      1      1
##      [,211] [,212] [,213] [,214] [,215] [,216] [,217] [,218] [,219] [,220]
## [1,]      1      0      0      0      1      0      1      1      1      0
## [2,]      1      0      0      0      1      0      1      1      1      0
##      [,221]
## [1,]      1
## [2,]      1
## 
## $out
##  [1] 1 1 1 1 1 1 1 1 0 0 1 1 0 1 1 1 1 0 1 1 0 0 0 0 0 1 1 0 1
## 
## $group
##  [1]  35  42  50  53  54  59  69  69  70  70  71  71  75  78  78  84  84
87  93
## [20] 103 132 132 146 146 147 153 159 161 164
```

```
##
## $names
##   [1] "85"  "100" "110" "113" "117" "123" "126" "129" "131" "132" "139"
"141"
##  [13] "142" "147" "149" "152" "153" "156" "157" "159" "160" "161" "163"
"164"
##  [25] "165" "166" "167" "168" "169" "170" "171" "172" "173" "174" "175"
"176"
##  [37] "177" "178" "179" "180" "181" "182" "183" "184" "185" "186" "187"
"188"
##  [49] "190" "192" "193" "194" "195" "196" "197" "198" "199" "200" "201"
"202"
##  [61] "203" "204" "205" "206" "207" "208" "209" "210" "211" "212" "213"
"214"
##  [73] "215" "216" "217" "218" "219" "220" "221" "222" "223" "224" "225"
"226"
##  [85] "227" "228" "229" "230" "231" "232" "233" "234" "235" "236" "237"
"238"
##  [97] "239" "240" "241" "242" "243" "244" "245" "246" "247" "248" "249"
"250"
## [109] "251" "252" "253" "254" "255" "256" "257" "258" "259" "260" "261"
"262"
## [121] "263" "264" "265" "266" "267" "268" "269" "270" "271" "272" "273"
"274"
## [133] "275" "276" "277" "278" "279" "280" "281" "282" "283" "284" "285"
"286"
## [145] "287" "288" "289" "290" "291" "292" "293" "294" "295" "297" "298"
"299"
## [157] "300" "302" "303" "304" "305" "306" "307" "308" "309" "310" "311"
"312"
## [169] "313" "315" "316" "318" "319" "320" "321" "322" "325" "326" "327"
"328"
## [181] "329" "330" "331" "333" "335" "336" "337" "338" "339" "340" "341"
"342"
## [193] "344" "347" "349" "353" "354" "355" "358" "360" "365" "369" "384"
"385"
## [205] "388" "392" "393" "394" "404" "407" "409" "412" "417" "458" "466"
"468"
## [217] "491" "518" "529" "564" "603"
```

```
heart_fbs_boxplot
```

```
## $stats
##      [,1] [,2]
## [1,]    0    0
## [2,]    0    0
## [3,]    0    1
## [4,]    1    1
## [5,]    1    1
##
```

```
## $n
## [1] 936 254
##
## $conf
##             [,1]     [,2]
## [1,] -0.05164392 0.900862
## [2,]  0.05164392 1.099138
##
## $out
## numeric(0)
##
## $group
## numeric(0)
##
## $names
## [1] "0" "1"
```

```
heart_mhr_boxplot
```

```
## $stats
##      [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12] [,13]
[,14]
## [1,]    1    1    1    0    1    1    1    1    1     1   0.0     1     1
1
## [2,]    1    1    1    0    1    1    1    1    1     1   0.0     1     1
1
## [3,]    1    1    1    0    1    1    1    1    1     1   0.5     1     1
1
## [4,]    1    1    1    0    1    1    1    1    1     1   1.0     1     1
1
## [5,]    1    1    1    0    1    1    1    1    1     1   1.0     1     1
1
##      [,15] [,16] [,17] [,18] [,19] [,20] [,21] [,22] [,23] [,24] [,25]
[,26]
## [1,]   0.0     1     1   0.0     1     1     1     1     1     0   0.0
1
## [2,]   0.0     1     1   0.5     1     1     1     1     1     0   0.5
1
## [3,]   0.5     1     1   1.0     1     1     1     1     1     1   1.0
1
## [4,]   1.0     1     1   1.0     1     1     1     1     1     1   1.0
1
## [5,]   1.0     1     1   1.0     1     1     1     1     1     1   1.0
1
##      [,27] [,28] [,29] [,30] [,31] [,32] [,33] [,34] [,35] [,36] [,37]
[,38]
## [1,]     1     0     1     1     1     1     1     0     1     1     0
0
## [2,]     1     0     1     1     1     1     1     0     1     1     0
0
```

```
## [3,]     1     1     1     1     1     1     1     0     1     1     1
1
## [4,]     1     1     1     1     1     1     1     0     1     1     1
1
## [5,]     1     1     1     1     1     1     1     0     1     1     1
1
##      [,39] [,40] [,41] [,42] [,43] [,44] [,45] [,46] [,47] [,48] [,49]
[,50]
## [1,]     1     1     0     0     0     1     0     1     0     0     0
0.0
## [2,]     1     1     0     0     0     1     0     1     0     0     0
0.5
## [3,]     1     1     1     1     0     1     1     1     1     1     1
1.0
## [4,]     1     1     1     1     1     1     1     1     1     1     1
1.0
## [5,]     1     1     1     1     1     1     1     1     1     1     1
1.0
##      [,51] [,52] [,53] [,54] [,55] [,56] [,57] [,58] [,59] [,60] [,61]
[,62]
## [1,]     1     1     0     1     1     1     0     0     0     0   0.0
0
## [2,]     1     1     0     1     1     1     0     0     0     0   0.5
0
## [3,]     1     1     1     1     1     1     1     1     1     0   1.0
0
## [4,]     1     1     1     1     1     1     1     1     1     1   1.0
1
## [5,]     1     1     1     1     1     1     1     1     1     1   1.0
1
##      [,63] [,64] [,65] [,66] [,67] [,68] [,69] [,70] [,71] [,72] [,73]
[,74]
## [1,]   0.0     0     0     0     0   0.0     0     0     0     0     0
0
## [2,]   0.5     0     0     0     0   0.5     0     0     0     0     0
0
## [3,]   1.0     0     0     0     1   1.0     0     0     1     1     1
1
## [4,]   1.0     0     1     1     1   1.0     1     1     1     1     1
1
## [5,]   1.0     0     1     1     1   1.0     1     1     1     1     1
1
##      [,75] [,76] [,77] [,78] [,79] [,80] [,81] [,82] [,83] [,84] [,85]
[,86]
## [1,]     0   0.0     0     0     0     0     0     0     0     0   0.0
0
## [2,]     0   0.0     0     0     0     0     0     0     0     0   0.0
0
## [3,]     0   0.5     1     0     0     0     0     0     1     0   0.5
0
```

```
## [4,]     1   1.0     1     0     1     1     1     1     1     1   1.0
1
## [5,]     1   1.0     1     0     1     1     1     1     1     1   1.0
1
##      [,87] [,88] [,89] [,90] [,91] [,92] [,93] [,94] [,95] [,96] [,97]
[,98]
## [1,]     0     0   0.0     0     0     0     0     0     0     0     0
0.0
## [2,]     0     0   0.0     0     0     0     0     0     0     0     0
0.0
## [3,]     0     0   0.0     0     0     0     1     0     0     0     0
0.0
## [4,]     1     1   0.5     1     0     1     1     0     1     1     1
0.5
## [5,]     1     1   1.0     1     0     1     1     0     1     1     1
1.0
##      [,99] [,100] [,101] [,102] [,103] [,104] [,105] [,106] [,107] [,108]
## [1,]     0      0      0      0    0.0      1      0      0      0    0.0
## [2,]     0      0      0      0    0.0      1      0      0      0    0.0
## [3,]     0      0      0      0    0.5      1      0      0      0    0.5
## [4,]     0      1      1      0    1.0      1      0      0      0    1.0
## [5,]     0      1      1      0    1.0      1      0      0      0    1.0
##      [,109] [,110] [,111] [,112] [,113] [,114] [,115] [,116] [,117] [,118]
## [1,]      0      0      0      0      0      0      0      0      0      1
## [2,]      0      0      0      0      0      0      0      0      0      1
## [3,]      0      0      0      0      0      0      0      0      0      1
## [4,]      1      0      0      0      0      0      0      0      0      1
## [5,]      1      0      0      0      0      0      0      0      0      1
##      [,119]
## [1,]      0
## [2,]      0
## [3,]      0
## [4,]      0
## [5,]      0
## 
## $n
##   [1]  1  1  1  1  1  2  2  1  1  1  2  3  1  3  4  1  3  3  1  6  2  4  3
9  4
##  [26]  9  8 14  4  6  2 14  6  1 10  7 23  8 15  6  9 17 11  7 14  5 39  6
24  8
##  [51] 10 28 16  9 15  5 36 10 17  7  7 15  7  8 17  8 46  8 20 15 17 18  9
10 14
##  [76]  8 49  9 17  8 17 17 15 12 14  9 35 12 23 18  5 16  7  3 13 10 25  8
17 13
## [101] 10 13  2  2 11 10 12  4 10  5  5  4  2  3  3  2  2  2  2
## 
## $conf
##      [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10]      [,11] [,12]
[,13]
## [1,]    1    1    1    0    1    1    1    1    1     1 -0.6172287     1
```

```
1
## [2,]    1    1    1    0    1    1    1    1    1     1  1.6172287     1
1
##      [,14] [,15] [,16] [,17]     [,18] [,19] [,20] [,21] [,22] [,23]
[,24]
## [1,]     1 -0.29     1     1 0.5438933     1     1     1     1     1
0.4733333
## [2,]     1  1.29     1     1 1.4561067     1     1     1     1     1
1.5266667
##      [,25] [,26] [,27]     [,28] [,29] [,30] [,31] [,32] [,33] [,34] [,35]
## [1,] 0.605     1     1 0.5777272     1     1     1     1     1     0     1
## [2,] 1.395     1     1 1.4222728     1     1     1     1     1     0     1
##      [,36]     [,37]     [,38] [,39] [,40]     [,41]     [,42]      [,43]
[,44]
## [1,]     1 0.6705472 0.4413856     1     1 0.4733333 0.6167937 -0.4763879
1
## [2,]     1 1.3294528 1.5586144     1     1 1.5266667 1.3832063  0.4763879
1
##          [,45] [,46]     [,47]     [,48]     [,49]     [,50] [,51] [,52]
[,53]
## [1,] 0.5777272     1 0.7469975 0.3549677 0.6774839 0.7206928     1     1
0.605
## [2,] 1.4222728     1 1.2530025 1.6450323 1.3225161 1.2793072     1     1
1.395
##      [,54] [,55] [,56]     [,57]     [,58]     [,59]      [,60]     [,61]
## [1,]     1     1     1 0.7366667 0.5003601 0.6167937 -0.5971839 0.7014081
## [2,]     1     1     1 1.2633333 1.4996399 1.3832063  0.5971839 1.2985919
##           [,62]     [,63] [,64]      [,65]      [,66]     [,67]     [,68]
## [1,] -0.4079542 0.7014081     0 -0.3832063 -0.5586144 0.7670417 0.7206928
## [2,]  0.4079542 1.2985919     0  0.3832063  0.5586144 1.2329583 1.2793072
##           [,69]      [,70]     [,71]     [,72]     [,73]     [,74]
[,75]
## [1,] -0.3532987 -0.4079542 0.6167937 0.6275904 0.4733333 0.5003601 -
0.4222728
## [2,]  0.3532987  0.4079542 1.3832063 1.3724096 1.5266667 1.4996399
0.4222728
##            [,76]     [,77] [,78]      [,79]      [,80]      [,81]
[,82]
## [1,] -0.05861436 0.7742857     0 -0.3832063 -0.5586144 -0.3832063 -
0.3832063
## [2,]  1.05861436 1.2257143     0  0.3832063  0.5586144  0.3832063
0.3832063
##          [,83]      [,84]      [,85]      [,86]      [,87]      [,88]
## [1,] 0.5920458 -0.4561067 0.07772724 -0.5266667 -0.2670687 -0.4561067
## [2,] 1.4079542  0.4561067 0.92227276  0.5266667  0.2670687  0.4561067
##           [,89]      [,90] [,91]  [,92]     [,93] [,94]      [,95]
[,96]
## [1,] -0.1647264 -0.3724096     0 -0.395 0.4028161     0 -0.4382132 -
0.4996399
## [2,]  0.1647264  0.3724096     0  0.395 1.5971839     0  0.4382132
```

```
0.4996399
##       [,97]      [,98] [,99]     [,100]     [,101] [,102]     [,103]
[,104]
## [1,] -0.316 -0.2793072     0 -0.4382132 -0.4996399      0 -0.6172287
1
## [2,]  0.316  0.2793072     0  0.4382132  0.4996399      0  1.6172287
1
##      [,105] [,106] [,107] [,108]     [,109] [,110] [,111] [,112] [,113]
[,114]
## [1,]      0      0      0  -0.29 -0.4996399      0      0      0      0
0
## [2,]      0      0      0   1.29  0.4996399      0      0      0      0
0
##      [,115] [,116] [,117] [,118] [,119]
## [1,]      0      0      0      1      0
## [2,]      0      0      0      1      0
##
## $out
##  [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1
##
## $group
##  [1]  26  26  27  32  32  33  39  39  51  52  52  52  52  52  52  54  54
55  55
## [20]  55  56  91 102 102 102 107 107
##
## $names
##   [1] "60"  "63"  "67"  "69"  "70"  "71"  "72"  "73"  "77"  "78"  "80"
"82"
##  [13] "83"  "84"  "86"  "87"  "88"  "90"  "91"  "92"  "93"  "94"  "95"
"96"
##  [25] "97"  "98"  "99"  "100" "102" "103" "104" "105" "106" "107" "108"
"109"
##  [37] "110" "111" "112" "113" "114" "115" "116" "117" "118" "119" "120"
"121"
##  [49] "122" "123" "124" "125" "126" "127" "128" "129" "130" "131" "132"
"133"
##  [61] "134" "135" "136" "137" "138" "139" "140" "141" "142" "143" "144"
"145"
##  [73] "146" "147" "148" "149" "150" "151" "152" "153" "154" "155" "156"
"157"
##  [85] "158" "159" "160" "161" "162" "163" "164" "165" "166" "167" "168"
"169"
##  [97] "170" "171" "172" "173" "174" "175" "176" "177" "178" "179" "180"
"181"
## [109] "182" "184" "185" "186" "187" "188" "190" "192" "194" "195" "202"
```

```
heart_STs_boxplot
```

```
## $stats
##      [,1] [,2] [,3] [,4]
```

```
## [1,]    1    0    1    0
## [2,]    1    0    1    0
## [3,]    1    0    1    1
## [4,]    1    0    1    1
## [5,]    1    0    1    1
##
## $n
## [1]   1 526 582  81
##
## $conf
##      [,1] [,2] [,3]      [,4]
## [1,]    1    0    1 0.8244444
## [2,]    1    0    1 1.1755556
##
## $out
##   [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1
##  [38] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1
##  [75] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 0
## [112] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
## [149] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
## [186] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
## [223] 0 0 0 0 0 0 0 0 0 0 0
##
## $group
##   [1] 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
2 2 2
##  [38] 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
2 2 2
##  [75] 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
2 2 3
## [112] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
3 3 3
## [149] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
3 3 3
## [186] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
3 3 3
## [223] 3 3 3 3 3 3 3 3 3 3 3
##
## $names
## [1] "0" "1" "2" "3"

# outlier values can be extracted from this object
#   they are stored in the element 'out' of the list
heart_sex_boxplot$out
```

```
##  [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1
## [39] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
heart_cpt_boxplot$out
```

```
##   [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0
0 0 0
##  [38] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
##  [75] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
## [112] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
## [149] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

```
heart_rbps_boxplot$out
```

```
## [1] 1 0 0 0 0 0 0 0 0
```

```
heart_chol_boxplot$out
```

```
##  [1] 1 1 1 1 1 1 1 1 0 0 1 1 0 1 1 1 1 0 1 1 0 0 0 0 0 1 1 0 1
```

```
heart_fbs_boxplot$out
```

```
## numeric(0)
```

```
heart_mhr_boxplot$out
```

```
##  [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1
```

```
heart_STs_boxplot$out
```

```
##   [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1
##  [38] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1
##  [75] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 0
## [112] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
## [149] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
## [186] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0
## [223] 0 0 0 0 0 0 0 0 0 0 0
```

```
# get the minimum value that is an outlier
min(heart_sex_boxplot$out)
```

```
## [1] 1
```

```r
min(heart_cpt_boxplot$out)

## [1] 0

min(heart_rbps_boxplot$out)

## [1] 0

min(heart_chol_boxplot$out)

## [1] 0

min(heart_fbs_boxplot$out)

## Warning in min(heart_fbs_boxplot$out): no non-missing arguments to min;
## returning Inf

## [1] Inf

min(heart_mhr_boxplot$out)

## [1] 0

min(heart_STs_boxplot$out)

## [1] 0

# outliers rows can be extracted by conditional selection
heart_clean[heart_clean$sex >= min(heart_sex_boxplot$out), ]

##      age sex chest.pain.type resting.bp.s cholesterol fasting.blood.sugar
## 1     40   1               2          140         289                   0
## 3     37   1               2          130         283                   0
## 5     54   1               3          150         195                   0
## 6     39   1               3          120         339                   0
## 8     54   1               2          110         208                   0
## 9     37   1               4          140         207                   0
## 12    58   1               2          136         164                   0
## 13    39   1               2          120         204                   0
## 14    49   1               4          140         234                   0
## 17    38   1               4          110         196                   0
## 19    60   1               4          100         248                   0
## 20    36   1               2          120         267                   0
## 22    44   1               2          120         184                   0
## 24    44   1               2          150         288                   0
## 25    40   1               3          130         215                   0
## 26    36   1               3          130         209                   0
## 27    53   1               4          124         260                   0
## 28    52   1               2          120         284                   0
## 30    51   1               2          125         188                   0
## 31    53   1               3          145         518                   0
## 32    56   1               3          130         167                   0
## 33    54   1               4          125         224                   0
```

```
## 34   41  1               4          130          172                    0
## 36   32  1               2          125          254                    0
## 37   65  1               4          140          306                    1
## 43   35  1               2          150          264                    0
## 44   52  1               3          140          259                    0
## 45   43  1               4          120          175                    0
## 46   59  1               3          130          318                    0
## 47   37  1               4          120          223                    0
## 48   50  1               2          140          216                    0
## 49   36  1               3          112          340                    0
## 50   41  1               4          110          289                    0
## 51   50  1               4          130          233                    0
## 53   45  1               2          140          224                    1
## 57   31  1               4          120          270                    0
## 58   58  1               3          130          213                    0
## 59   54  1               4          150          365                    0
## 60   52  1               4          112          342                    0
## 61   49  1               2          100          253                    0
## 63   45  1               4          140          224                    0
## 64   46  1               4          120          277                    0
## 68   32  1               2          110          225                    0
## 69   52  1               4          160          246                    0
## 70   44  1               4          150          412                    0
## 71   57  1               2          140          265                    0
## 72   44  1               2          130          215                    0
## 73   52  1               4          120          182                    0
## 75   55  1               4          140          268                    0
## 76   46  1               3          150          163                    0
## 77   32  1               4          118          529                    0
## 79   52  1               2          140          100                    0
## 80   49  1               4          130          206                    0
## 81   55  1               3          110          277                    0
## 82   54  1               2          120          238                    0
## 83   63  1               4          150          223                    0
## 84   52  1               2          160          196                    0
## 85   56  1               4          150          213                    1
## 86   66  1               4          140          139                    0
## 87   65  1               4          170          263                    1
## 89   43  1               1          120          291                    0
## 90   55  1               4          140          229                    0
## 92   39  1               4          130          307                    0
## 94   48  1               4          160          329                    0
## 96   58  1               4          130          263                    0
## 97   43  1               2          142          207                    0
## 98   39  1               3          160          147                    1
## 99   56  1               4          120           85                    0
## 100  41  1               2          125          269                    0
## 101  65  1               4          130          275                    0
## 102  51  1               4          130          179                    0
## 104  40  1               4          120          466                    1
```

```
## 105   46   1               4         118        186                 0
## 106   57   1               2         140        260                 1
## 108   34   1               2         150        214                 0
## 109   50   1               4         140        129                 0
## 110   39   1               2         190        241                 0
## 112   57   1               4         150        255                 0
## 113   47   1               4         140        276                 1
## 114   38   1               2         140        297                 0
## 117   38   1               4         120        282                 0
## 120   34   1               1         140        156                 0
## 123   46   1               4         110        240                 0
## 125   58   1               2         130        230                 0
## 126   54   1               2         120        246                 0
## 130   42   1               3         120        228                 0
## 131   38   1               3         145        292                 0
## 132   46   1               4         110        202                 0
## 133   56   1               4         170        388                 0
## 134   56   1               4         150        230                 0
## 136   49   1               3         115        265                 0
## 138   39   1               2         120        241                 0
## 139   54   1               4         140        166                 0
## 140   43   1               4         150        247                 0
## 141   52   1               4         160        331                 0
## 142   50   1               4         140        341                 0
## 143   47   1               4         160        291                 0
## 144   53   1               4         140        243                 0
## 146   39   1               4         110        273                 0
## 147   42   1               2         120        198                 0
## 149   50   1               2         120        168                 0
## 150   54   1               4         130        603                 1
## 151   39   1               2         130        215                 0
## 152   48   1               2         100        159                 0
## 153   40   1               2         130        275                 0
## 154   55   1               4         120        270                 0
## 155   41   1               2         120        291                 0
## 156   56   1               4         155        342                 1
## 157   38   1               4         110        190                 0
## 158   49   1               4         140        185                 0
## 159   44   1               4         130        290                 0
## 160   54   1               2         160        195                 0
## 161   59   1               4         140        264                 1
## 162   49   1               4         128        212                 0
## 163   47   1               2         160        263                 0
## 165   42   1               2         120        196                 0
## 167   46   1               1         140        272                 1
## 168   50   1               4         140        231                 0
## 169   48   1               2         140        238                 0
## 170   58   1               4         135        222                 0
## 171   58   1               3         140        179                 0
## 172   29   1               2         120        243                 0
```

```
## 173   40   1               3            140           235                  0
## 174   53   1               2            140           320                  0
## 175   49   1               3            140           187                  0
## 176   52   1               4            140           266                  0
## 177   43   1               4            140           288                  0
## 178   54   1               4            140           216                  0
## 179   59   1               2            140           287                  0
## 180   37   1               3            130           194                  0
## 182   52   1               4            130           225                  0
## 183   51   1               2            130           224                  0
## 184   52   1               4            140           404                  0
## 185   46   1               4            110           238                  0
## 187   58   1               3            160           211                  1
## 188   58   1               2            130           251                  0
## 189   41   1               4            120           237                  1
## 191   53   1               4            180           285                  0
## 192   46   1               4            180           280                  0
## 193   50   1               2            170           209                  0
## 194   48   1               2            130           245                  0
## 195   45   1               3            135           192                  0
## 198   49   1               4            120           297                  0
## 199   42   1               2            150           268                  0
## 200   53   1               4            120           246                  0
## 202   47   1               1            110           249                  0
## 203   46   1               3            120           230                  0
## 204   42   1               3            160           147                  0
## 206   56   1               2            130           184                  0
## 207   50   1               4            150           215                  0
## 208   35   1               2            120           308                  0
## 209   35   1               2            110           257                  0
## 210   28   1               2            130           132                  0
## 211   54   1               4            125           216                  0
## 212   48   1               4            106           263                  1
## 214   56   1               3            130           276                  0
## 216   47   1               4            150           226                  0
## 218   39   1               4            110           280                  0
## 219   54   1               3            120           217                  0
## 220   55   1               2            140           196                  0
## 221   29   1               2            140           263                  0
## 222   46   1               4            130           222                  0
## 225   33   1               3            120           298                  0
## 226   55   1               2            120           256                  1
## 227   50   1               4            145           264                  0
## 228   53   1               3            120           195                  0
## 229   38   1               4             92           117                  0
## 230   41   1               2            120           295                  0
## 232   37   1               4            130           315                  0
## 233   40   1               3            130           281                  0
## 235   41   1               4            112           250                  0
## 237   39   1               2            120           200                  0
```

```
## 238   41   1          4      120      336           0
## 239   55   1          1      140      295           0
## 240   48   1          4      160      355           0
## 241   48   1          4      160      193           0
## 242   55   1          2      145      326           0
## 243   54   1          4      200      198           0
## 244   55   1          2      160      292           1
## 246   48   1          4      160      268           0
## 247   54   1          1      120      171           0
## 248   54   1          3      120      237           0
## 249   48   1          4      122      275           1
## 250   45   1          4      130      219           0
## 251   49   1          4      130      341           0
## 252   44   1          4      135      491           0
## 253   48   1          4      120      260           0
## 254   61   1          4      125      292           0
## 255   62   1          2      140      271           0
## 256   55   1          4      145      248           0
## 259   36   1          3      150      160           0
## 262   46   1          2      140      275           0
## 264   46   1          4      120      231           0
## 265   59   1          4      130      126           0
## 266   47   1          3      140      193           0
## 267   54   1          2      160      305           0
## 268   52   1          4      130      298           0
## 269   34   1          2       98      220           0
## 270   54   1          4      130      242           0
## 272   45   1          4      120      225           0
## 274   55   1          4      140      201           0
## 275   55   1          3      120      220           0
## 277   59   1          3      180      213           0
## 278   51   1          3      135      160           0
## 279   52   1          4      170      223           0
## 282   60   1          3      120      246           0
## 283   49   1          4      150      222           0
## 286   42   1          4      140      358           0
## 288   59   1          4      140      169           0
## 289   53   1          2      120      181           0
## 291   36   1          2      120      166           0
## 292   48   1          3      110      211           0
## 294   53   1          4      130      182           0
## 418   63   1          4      140      260           0
## 419   44   1          4      130      209           0
## 420   60   1          4      132      218           0
## 421   55   1          4      142      228           0
## 422   66   1          3      110      213           1
## 424   65   1          4      150      236           1
## 427   60   1          2      160      267           1
## 428   56   1          2      126      166           0
## 433   62   1          4      120      220           0
```

```
## 434   63   1              4        170        177              0
## 435   46   1              4        110        236              0
## 445   60   1              4        130        186              1
## 446   56   1              4        120        100              0
## 447   55   1              3        136        228              0
## 449   77   1              4        124        171              0
## 450   63   1              4        160        230              1
## 454   60   1              4        140        281              0
## 456   58   1              4        136        203              1
## 462   57   1              4        139        277              1
## 464   59   1              4        122        233              0
## 467   42   1              3        134        240              0
## 470   62   1              4        152        153              0
## 471   56   1              2        124        224              1
## 475   60   1              3        141        316              1
## 478   51   1              4        132        218              1
## 480   57   1              4        130        311              1
## 484   67   1              1        142        270              1
## 487   63   1              2        139        217              1
## 488   55   1              2        110        214              1
## 489   57   1              4        140        214              0
## 490   65   1              1        140        252              0
## 491   54   1              4        136        220              0
## 492   72   1              3        120        214              0
## 493   75   1              4        170        203              1
## 495   51   1              3        137        339              0
## 496   60   1              4        142        216              0
## 498   58   1              4        132        458              1
## 499   61   1              4        146        241              0
## 500   67   1              4        160        384              1
## 501   62   1              4        135        297              0
## 502   65   1              4        136        248              0
## 503   63   1              4        130        308              0
## 504   69   1              4        140        208              0
## 505   51   1              4        132        227              1
## 506   62   1              4        158        210              1
## 507   55   1              3        136        245              1
## 508   75   1              4        136        225              0
## 509   40   1              3        106        240              0
## 511   58   1              4        110        198              0
## 512   60   1              4        136        195              0
## 513   63   1              4        160        267              1
## 514   35   1              3        123        161              0
## 515   62   1              1        112        258              0
## 518   68   1              3        150        195              1
## 519   65   1              4        150        235              0
## 521   63   1              4         96        305              0
## 522   64   1              4        130        223              0
## 523   61   1              4        120        282              0
## 524   50   1              4        144        349              0
```

```
## 525   59   1              4          124         160                  0
## 526   55   1              4          150         160                  0
## 527   45   1              3          130         236                  0
## 528   65   1              4          144         312                  0
## 529   61   1              2          139         283                  0
## 530   49   1              3          131         142                  0
## 531   72   1              4          143         211                  0
## 532   50   1              4          133         218                  0
## 533   64   1              4          143         306                  1
## 534   55   1              4          116         186                  1
## 535   63   1              4          110         252                  0
## 536   59   1              4          125         222                  0
## 539   74   1              4          150         258                  1
## 540   54   1              4          130         202                  1
## 541   57   1              4          110         197                  0
## 542   62   1              3          138         204                  0
## 543   76   1              3          104         113                  0
## 545   70   1              4          170         192                  0
## 547   48   1              4          132         272                  0
## 548   48   1              3          132         220                  1
## 549   61   1              1          142         200                  1
## 550   66   1              4          112         261                  0
## 551   68   1              1          139         181                  1
## 552   55   1              4          172         260                  0
## 553   62   1              3          120         220                  0
## 554   71   1              3          144         221                  0
## 555   74   1              1          145         216                  1
## 556   53   1              3          155         175                  1
## 557   58   1              3          150         219                  0
## 558   75   1              4          160         310                  1
## 559   56   1              3          137         208                  1
## 560   58   1              3          137         232                  0
## 561   64   1              4          134         273                  0
## 562   54   1              3          133         203                  0
## 563   54   1              2          132         182                  0
## 564   59   1              4          140         274                  0
## 565   55   1              4          135         204                  1
## 566   57   1              4          144         270                  1
## 567   61   1              4          141         292                  0
## 568   41   1              4          150         171                  0
## 569   71   1              4          130         221                  0
## 570   38   1              4          110         289                  0
## 571   55   1              4          158         217                  0
## 572   56   1              4          128         223                  0
## 573   69   1              4          140         110                  1
## 574   64   1              4          150         193                  0
## 575   72   1              4          160         123                  1
## 576   69   1              4          142         210                  1
## 577   56   1              4          137         282                  1
## 578   62   1              4          139         170                  0
```

```
## 579   67   1              4         146        369                 0
## 580   57   1              4         156        173                 0
## 581   69   1              4         145        289                 1
## 582   51   1              4         131        152                 1
## 583   48   1              4         140        208                 0
## 584   69   1              4         122        216                 1
## 585   69   1              3         142        271                 0
## 586   64   1              4         141        244                 1
## 587   57   1              2         180        285                 1
## 588   53   1              4         124        243                 0
## 589   37   1              3         118        240                 0
## 590   67   1              4         140        219                 0
## 591   74   1              3         140        237                 1
## 592   63   1              2         136        165                 0
## 593   58   1              4         100        213                 0
## 594   61   1              4         190        287                 1
## 595   64   1              4         130        258                 1
## 596   58   1              4         160        256                 1
## 597   60   1              4         130        186                 1
## 598   57   1              4         122        264                 0
## 599   55   1              3         133        185                 0
## 600   55   1              4         120        226                 0
## 601   56   1              4         130        203                 1
## 602   57   1              4         130        207                 0
## 603   61   1              3         140        284                 0
## 604   61   1              3         120        337                 0
## 605   58   1              3         150        219                 0
## 606   74   1              4         155        310                 0
## 607   68   1              3         134        254                 1
## 609   62   1              4         160        254                 1
## 610   53   1              4         144        300                 1
## 611   62   1              4         158        170                 0
## 612   46   1              4         134        310                 0
## 614   62   1              1         135        139                 0
## 615   55   1              4         122        223                 1
## 616   58   1              4         140        385                 1
## 617   62   1              2         120        254                 0
## 618   70   1              4         130        322                 0
## 620   57   1              2         124        261                 0
## 621   64   1              4         128        263                 0
## 623   65   1              4         120        177                 0
## 624   56   1              3         130        256                 1
## 625   59   1              4         110        239                 0
## 626   60   1              4         140        293                 0
## 628   59   1              4         135        234                 0
## 629   53   1              4         142        226                 0
## 630   44   1              3         140        235                 0
## 631   61   1              1         134        234                 0
## 634   46   1              4         140        311                 0
## 635   53   1              4         140        203                 1
```

```
## 636   64  1               1          110          211                  0
## 637   40  1               1          140          199                  0
## 638   67  1               4          120          229                  0
## 639   48  1               2          130          245                  0
## 640   43  1               4          115          303                  0
## 641   47  1               4          112          204                  0
## 646   58  1               3          112          230                  0
## 648   57  1               3          128          229                  0
## 649   66  1               4          160          228                  0
## 651   59  1               4          170          326                  0
## 652   50  1               4          144          200                  0
## 653   48  1               4          130          256                  1
## 654   61  1               4          140          207                  0
## 655   59  1               1          160          273                  0
## 656   42  1               3          130          180                  0
## 657   48  1               4          122          222                  0
## 658   40  1               4          152          223                  0
## 660   44  1               3          130          233                  0
## 661   46  1               2          101          197                  1
## 662   59  1               3          126          218                  1
## 663   58  1               3          140          211                  1
## 664   49  1               3          118          149                  0
## 665   44  1               4          110          197                  0
## 666   66  1               2          160          246                  0
## 668   42  1               4          136          315                  0
## 669   52  1               2          128          205                  1
## 674   61  1               4          138          166                  0
## 677   62  1               2          120          281                  0
## 678   57  1               3          150          126                  1
## 680   44  1               3          120          226                  0
## 682   63  1               1          145          233                  1
## 683   57  1               4          150          276                  0
## 684   51  1               4          140          261                  0
## 687   47  1               3          108          243                  0
## 688   61  1               4          120          260                  0
## 690   70  1               2          156          245                  0
## 693   45  1               4          142          309                  0
## 694   45  1               4          104          208                  0
## 697   56  1               2          120          236                  0
## 698   58  1               4          146          218                  0
## 699   35  1               4          120          198                  0
## 700   58  1               4          150          270                  0
## 701   41  1               3          130          214                  0
## 702   57  1               4          110          201                  0
## 703   42  1               1          148          244                  0
## 704   62  1               2          128          208                  1
## 705   59  1               1          178          270                  0
## 707   50  1               4          150          243                  0
## 708   59  1               2          140          221                  0
## 710   54  1               4          124          266                  0
```

```
## 711   54   1                 4           110          206                      0
## 712   52   1                 4           125          212                      0
## 713   47   1                 4           110          275                      0
## 714   66   1                 4           120          302                      0
## 715   58   1                 4           100          234                      0
## 719   67   1                 4           120          237                      0
## 721   57   1                 4           165          289                      1
## 722   63   1                 4           130          254                      0
## 723   48   1                 4           124          274                      0
## 724   51   1                 3           100          222                      0
## 726   59   1                 4           140          177                      0
## 729   41   1                 2           110          235                      0
## 732   42   1                 2           120          295                      0
## 734   46   1                 4           120          249                      0
## 737   56   1                 4           130          283                      1
## 738   49   1                 3           120          188                      0
## 739   54   1                 4           122          286                      0
## 740   57   1                 4           152          274                      0
## 742   54   1                 3           125          273                      0
## 744   62   1                 4           120          267                      0
## 746   52   1                 2           134          201                      0
## 747   60   1                 4           117          230                      1
## 749   66   1                 4           112          212                      0
## 750   42   1                 4           140          226                      0
## 751   64   1                 4           120          246                      0
## 752   54   1                 3           150          232                      0
## 755   56   1                 4           125          249                      1
## 757   57   1                 4           132          207                      0
## 758   64   1                 4           145          212                      0
## 759   59   1                 4           138          271                      0
## 760   50   1                 3           140          233                      0
## 761   51   1                 1           125          213                      0
## 762   54   1                 2           192          283                      0
## 763   53   1                 4           123          282                      0
## 764   52   1                 4           112          230                      0
## 765   40   1                 4           110          167                      0
## 766   58   1                 3           132          224                      0
## 768   41   1                 3           112          250                      0
## 774   55   1                 4           140          217                      0
## 775   45   1                 2           128          308                      0
## 776   56   1                 1           120          193                      0
## 778   38   1                 1           120          231                      0
## 780   55   1                 2           130          262                      0
## 781   58   1                 4           128          259                      0
## 782   43   1                 4           110          211                      0
## 785   53   1                 3           130          197                      1
## 787   65   1                 1           138          282                      1
## 788   69   1                 1           160          234                      1
## 789   69   1                 3           140          254                      0
## 790   67   1                 4           100          299                      0
```

```
## 792   34  1          1      118      182         0
## 794   51  1          4      140      298         0
## 795   46  1          3      150      231         0
## 796   67  1          4      125      254         1
## 797   50  1          3      129      196         0
## 798   42  1          3      120      240         1
## 800   41  1          4      110      172         0
## 802   53  1          3      130      246         1
## 803   43  1          3      130      315         0
## 804   56  1          4      132      184         0
## 805   52  1          4      108      233         1
## 807   70  1          3      160      269         0
## 808   54  1          4      140      239         0
## 809   70  1          4      145      174         0
## 810   54  1          2      108      309         0
## 811   35  1          4      126      282         0
## 812   48  1          3      124      255         1
## 817   77  1          4      125      304         0
## 818   68  1          3      118      277         0
## 819   58  1          4      125      300         0
## 820   60  1          4      125      258         0
## 821   51  1          4      140      299         0
## 822   55  1          4      160      289         0
## 823   52  1          1      152      298         1
## 825   58  1          3      105      240         0
## 826   64  1          3      125      309         0
## 827   37  1          3      130      250         0
## 828   59  1          1      170      288         0
## 829   51  1          3      125      245         1
## 831   58  1          4      128      216         0
## 832   29  1          2      130      204         0
## 835   51  1          3       94      227         0
## 836   54  1          3      120      258         0
## 837   44  1          2      120      220         0
## 838   54  1          4      110      239         0
## 839   65  1          4      135      254         0
## 840   57  1          3      150      168         0
## 841   63  1          4      130      330         1
## 843   41  1          2      135      203         0
## 847   52  1          1      118      186         0
## 849   39  1          4      118      219         0
## 850   45  1          4      115      260         0
## 851   52  1          4      128      255         0
## 852   62  1          3      130      231         0
## 855   43  1          4      120      177         0
## 856   47  1          3      138      257         0
## 857   52  1          2      120      325         0
## 858   68  1          3      180      274         1
## 859   39  1          3      140      321         0
## 863   60  1          4      130      253         0
```

```
## 864   65  1              4           110           248                 0
## 866   60  1              3           140           185                 0
## 867   60  1              4           145           282                 0
## 868   54  1              4           120           188                 0
## 869   44  1              2           130           219                 0
## 870   44  1              4           112           290                 0
## 871   51  1              3           110           175                 0
## 872   59  1              3           150           212                 1
## 874   61  1              3           150           243                 1
## 875   55  1              4           132           353                 0
## 876   64  1              3           140           335                 0
## 877   43  1              4           150           247                 0
## 879   60  1              4           130           206                 0
## 880   58  1              2           120           284                 0
## 881   49  1              2           130           266                 0
## 882   48  1              2           110           229                 0
## 883   52  1              3           172           199                 1
## 884   44  1              2           120           263                 0
## 886   57  1              4           140           192                 0
## 887   67  1              4           160           286                 0
## 888   63  1              1           145           233                 1
## 889   67  1              4           160           286                 0
## 890   67  1              4           120           229                 0
## 891   37  1              3           130           250                 0
## 893   56  1              2           120           236                 0
## 896   63  1              4           130           254                 0
## 897   53  1              4           140           203                 1
## 898   57  1              4           140           192                 0
## 900   56  1              3           130           256                 1
## 901   44  1              2           120           263                 0
## 902   52  1              3           172           199                 1
## 903   57  1              3           150           168                 0
## 904   48  1              2           110           229                 0
## 905   54  1              4           140           239                 0
## 907   49  1              2           130           266                 0
## 908   64  1              1           110           211                 0
## 910   58  1              2           120           284                 0
## 911   58  1              3           132           224                 0
## 912   60  1              4           130           206                 0
## 916   43  1              4           150           247                 0
## 917   40  1              4           110           167                 0
## 919   60  1              4           117           230                 1
## 920   64  1              3           140           335                 0
## 921   59  1              4           135           234                 0
## 922   44  1              3           130           233                 0
## 923   42  1              4           140           226                 0
## 924   43  1              4           120           177                 0
## 925   57  1              4           150           276                 0
## 926   55  1              4           132           353                 0
## 927   61  1              3           150           243                 1
```

```
## 929   40   1                   1             140           199                   0
## 931   59   1                   3             150           212                   1
## 933   58   1                   3             112           230                   0
## 934   51   1                   3             110           175                   0
## 935   50   1                   4             150           243                   0
## 937   53   1                   3             130           197                   1
## 939   65   1                   4             120           177                   0
## 940   44   1                   4             112           290                   0
## 941   44   1                   2             130           219                   0
## 942   60   1                   4             130           253                   0
## 943   54   1                   4             124           266                   0
## 944   50   1                   3             140           233                   0
## 945   41   1                   4             110           172                   0
## 946   54   1                   3             125           273                   0
## 947   51   1                   1             125           213                   0
## 950   58   1                   4             128           216                   0
## 952   54   1                   4             120           188                   0
## 953   60   1                   4             145           282                   0
## 954   60   1                   3             140           185                   0
## 955   54   1                   3             150           232                   0
## 956   59   1                   4             170           326                   0
## 957   46   1                   3             150           231                   0
## 959   67   1                   4             125           254                   1
## 960   62   1                   4             120           267                   0
## 961   65   1                   4             110           248                   0
## 962   44   1                   4             110           197                   0
## 964   60   1                   4             125           258                   0
## 966   48   1                   2             130           245                   0
## 967   58   1                   4             150           270                   0
## 968   45   1                   4             104           208                   0
## 970   39   1                   3             140           321                   0
## 971   68   1                   3             180           274                   1
## 972   52   1                   2             120           325                   0
## 973   44   1                   3             140           235                   0
## 974   47   1                   3             138           257                   0
## 978   66   1                   4             120           302                   0
## 980   62   1                   3             130           231                   0
## 983   52   1                   4             128           255                   0
## 984   59   1                   4             110           239                   0
## 986   52   1                   2             134           201                   0
## 987   48   1                   4             122           222                   0
## 988   45   1                   4             115           260                   0
## 989   34   1                   1             118           182                   0
## 992   49   1                   3             120           188                   0
## 993   54   1                   2             108           309                   0
## 994   59   1                   4             140           177                   0
## 995   57   1                   3             128           229                   0
## 996   61   1                   4             120           260                   0
## 997   39   1                   4             118           219                   0
## 999   56   1                   4             125           249                   1
```

```
## 1000  52   1                 1            118            186                  0
## 1003  41   1                 2            135            203                  0
## 1004  58   1                 3            140            211                  1
## 1006  63   1                 4            130            330                  1
## 1007  65   1                 4            135            254                  0
## 1008  48   1                 4            130            256                  1
## 1010  51   1                 3            100            222                  0
## 1011  55   1                 4            140            217                  0
## 1012  65   1                 1            138            282                  1
## 1015  54   1                 4            110            239                  0
## 1016  44   1                 2            120            220                  0
## 1018  54   1                 3            120            258                  0
## 1019  51   1                 3             94            227                  0
## 1020  29   1                 2            130            204                  0
## 1021  51   1                 4            140            261                  0
## 1024  70   1                 4            145            174                  0
## 1025  62   1                 2            120            281                  0
## 1026  35   1                 4            120            198                  0
## 1027  51   1                 3            125            245                  1
## 1028  59   1                 2            140            221                  0
## 1029  59   1                 1            170            288                  0
## 1030  52   1                 2            128            205                  1
## 1031  64   1                 3            125            309                  0
## 1032  58   1                 3            105            240                  0
## 1033  47   1                 3            108            243                  0
## 1034  57   1                 4            165            289                  1
## 1035  41   1                 3            112            250                  0
## 1036  45   1                 2            128            308                  0
## 1038  52   1                 1            152            298                  1
## 1041  55   1                 4            160            289                  0
## 1042  64   1                 4            120            246                  0
## 1043  70   1                 4            130            322                  0
## 1044  51   1                 4            140            299                  0
## 1045  58   1                 4            125            300                  0
## 1046  60   1                 4            140            293                  0
## 1047  68   1                 3            118            277                  0
## 1048  46   1                 2            101            197                  1
## 1049  77   1                 4            125            304                  0
## 1052  48   1                 3            124            255                  1
## 1053  57   1                 4            132            207                  0
## 1054  52   1                 3            138            223                  0
## 1056  35   1                 4            126            282                  0
## 1058  70   1                 3            160            269                  0
## 1059  53   1                 4            142            226                  0
## 1062  64   1                 4            145            212                  0
## 1063  57   1                 4            152            274                  0
## 1064  52   1                 4            108            233                  1
## 1065  56   1                 4            132            184                  0
## 1066  43   1                 3            130            315                  0
## 1067  53   1                 3            130            246                  1
```

```
## 1068  48   1              4           124         274                    0
## 1070  42   1              1           148         244                    0
## 1071  59   1              1           178         270                    0
## 1074  42   1              3           120         240                    1
## 1075  66   1              2           160         246                    0
## 1076  54   1              2           192         283                    0
## 1077  69   1              3           140         254                    0
## 1078  50   1              3           129         196                    0
## 1079  51   1              4           140         298                    0
## 1080  43   1              4           132         247                    1
## 1083  67   1              4           100         299                    0
## 1084  69   1              1           160         234                    1
## 1087  59   1              1           160         273                    0
## 1090  57   1              3           150         126                    1
## 1092  43   1              4           110         211                    0
## 1093  45   1              4           142         309                    0
## 1094  58   1              4           128         259                    0
## 1095  50   1              4           144         200                    0
## 1096  55   1              2           130         262                    0
## 1099  38   1              1           120         231                    0
## 1100  41   1              3           130         214                    0
## 1102  52   1              4           112         230                    0
## 1103  56   1              1           120         193                    0
## 1107  59   1              4           138         271                    0
## 1111  53   1              4           123         282                    0
## 1114  47   1              4           112         204                    0
## 1116  54   1              4           110         206                    0
## 1117  66   1              4           112         212                    0
## 1120  49   1              3           118         149                    0
## 1123  54   1              4           122         286                    0
## 1124  56   1              4           130         283                    1
## 1125  46   1              4           120         249                    0
## 1127  42   1              2           120         295                    0
## 1128  41   1              2           110         235                    0
## 1131  61   1              1           134         234                    0
## 1133  67   1              4           120         237                    0
## 1134  58   1              4           100         234                    0
## 1135  47   1              4           110         275                    0
## 1136  52   1              4           125         212                    0
## 1137  62   1              2           128         208                    1
## 1138  57   1              4           110         201                    0
## 1139  58   1              4           146         218                    0
## 1140  64   1              4           128         263                    0
## 1142  43   1              4           115         303                    0
## 1146  70   1              2           156         245                    0
## 1147  57   1              2           124         261                    0
## 1151  44   1              3           120         226                    0
## 1152  61   1              4           138         166                    0
## 1153  42   1              4           136         315                    0
## 1154  52   1              4           128         204                    1
```

```
## 1155  59   1               3          126         218                   1
## 1156  40   1               4          152         223                   0
## 1157  42   1               3          130         180                   0
## 1158  61   1               4          140         207                   0
## 1159  66   1               4          160         228                   0
## 1160  46   1               4          140         311                   0
## 1162  59   1               1          134         204                   0
## 1163  64   1               1          170         227                   0
## 1166  57   1               2          154         232                   0
## 1168  57   1               4          110         335                   0
## 1169  47   1               3          130         253                   0
## 1171  35   1               2          122         192                   0
## 1172  61   1               4          148         203                   0
## 1173  58   1               4          114         318                   0
## 1175  58   1               2          125         220                   0
## 1176  56   1               2          130         221                   0
## 1177  56   1               2          120         240                   0
## 1178  67   1               3          152         212                   0
## 1180  44   1               4          120         169                   0
## 1181  63   1               4          140         187                   0
## 1183  41   1               2          120         157                   0
## 1184  59   1               4          164         176                   1
## 1186  45   1               1          110         264                   0
## 1187  68   1               4          144         193                   1
## 1188  57   1               4          130         131                   0
## 1190  38   1               3          138         175                   0
##      resting.ecg max.heart.rate exercise.angina oldpeak ST.slope target
## 1              0            172               0     0.0        1      0
## 3              1             98               0     0.0        1      0
## 5              0            122               0     0.0        1      0
## 6              0            170               0     0.0        1      0
## 8              0            142               0     0.0        1      0
## 9              0            130               1     1.5        2      1
## 12             1             99               1     2.0        2      1
## 13             0            145               0     0.0        1      0
## 14             0            140               1     1.0        2      1
## 17             0            166               0     0.0        2      1
## 19             0            125               0     1.0        2      1
## 20             0            160               0     3.0        2      1
## 22             0            142               0     1.0        2      0
## 24             0            150               1     3.0        2      1
## 25             0            138               0     0.0        1      0
## 26             0            178               0     0.0        1      0
## 27             1            112               1     3.0        2      0
## 28             0            118               0     0.0        1      0
## 30             0            145               0     0.0        1      0
## 31             0            130               0     0.0        2      1
## 32             0            114               0     0.0        1      0
## 33             0            122               0     2.0        2      1
## 34             1            130               0     2.0        2      1
```

```
## 36            0             155                0      0.0          1       0
## 37            0              87                1      1.5          2       1
## 43            0             168                0      0.0          1       0
## 44            1             170                0      0.0          1       0
## 45            0             120                1      1.0          2       1
## 46            0             120                1      1.0          2       0
## 47            0             168                0      0.0          1       0
## 48            0             170                0      0.0          1       0
## 49            0             184                0      1.0          2       0
## 50            0             170                0      0.0          2       1
## 51            0             121                1      2.0          2       1
## 53            0             122                0      0.0          1       0
## 57            0             153                1      1.5          2       1
## 58            1             140                0      0.0          2       1
## 59            1             134                0      1.0          1       0
## 60            1              96                1      1.0          2       1
## 61            0             174                0      0.0          1       0
## 63            0             144                0      0.0          1       0
## 64            0             125                1      1.0          2       1
## 68            0             184                0      0.0          1       0
## 69            1              82                1      4.0          2       1
## 70            0             170                0      0.0          1       0
## 71            1             145                1      1.0          2       1
## 72            0             135                0      0.0          1       0
## 73            0             150                0      0.0          2       1
## 75            0             128                1      1.5          2       1
## 76            0             116                0      0.0          1       0
## 77            0             130                0      0.0          2       1
## 79            0             138                1      0.0          1       0
## 80            0             170                0      0.0          2       1
## 81            0             160                0      0.0          1       0
## 82            0             154                0      0.0          1       0
## 83            0             115                0      0.0          2       1
## 84            0             165                0      0.0          1       0
## 85            0             125                1      1.0          2       1
## 86            0              94                1      1.0          2       1
## 87            0             112                1      2.0          2       1
## 89            1             155                0      0.0          2       1
## 90            0             110                1      0.5          2       0
## 92            0             140                0      0.0          1       0
## 94            0              92                1      1.5          2       1
## 96            0             140                1      2.0          2       1
## 97            0             138                0      0.0          1       0
## 98            0             160                0      0.0          1       0
## 99            0             140                0      0.0          1       0
## 100           0             144                0      0.0          1       0
## 101           1             115                1      1.0          2       1
## 102           0             100                0      0.0          1       0
## 104           0             152                1      1.0          2       1
## 105           0             124                0      0.0          2       1
```

```
## 106              0          140             0     0.0       1      0
## 108              1          168             0     0.0       1      0
## 109              0          135             0     0.0       1      0
## 110              0          106             0     0.0       1      0
## 112              0           92             1     3.0       2      1
## 113              0          125             1     0.0       1      0
## 114              0          150             0     0.0       1      0
## 117              0          170             0     0.0       2      1
## 120              0          180             0     0.0       2      1
## 123              1          140             0     0.0       1      0
## 125              0          150             0     0.0       1      0
## 126              0          110             0     0.0       1      0
## 130              0          152             1     1.5       2      0
## 131              0          130             0     0.0       1      0
## 132              0          150             1     0.0       2      1
## 133              1          122             1     2.0       2      1
## 134              1          124             1     1.5       2      1
## 136              0          175             0     0.0       2      1
## 138              1          146             0     2.0       1      0
## 139              0          118             1     0.0       2      1
## 140              0          130             1     2.0       2      1
## 141              0           94             1     2.5       2      1
## 142              1          125             1     2.5       2      1
## 143              1          158             1     3.0       2      1
## 144              0          155             0     0.0       1      0
## 146              0          132             0     0.0       1      0
## 147              0          155             0     0.0       1      0
## 149              0          160             0     0.0       1      0
## 150              0          125             1     1.0       2      1
## 151              0          120             0     0.0       1      0
## 152              0          100             0     0.0       1      0
## 153              0          150             0     0.0       1      0
## 154              0          140             0     0.0       1      0
## 155              1          160             0     0.0       1      0
## 156              0          150             1     3.0       2      1
## 157              0          150             1     1.0       2      1
## 158              0          130             0     0.0       1      0
## 159              0          100             1     2.0       2      1
## 160              1          130             0     1.0       1      0
## 161              2          119             1     0.0       2      1
## 162              0           96             1     0.0       2      1
## 163              0          174             0     0.0       1      0
## 165              0          150             0     0.0       1      0
## 167              0          175             0     2.0       2      1
## 168              1          140             1     5.0       2      1
## 169              0          118             0     0.0       1      0
## 170              0          100             0     0.0       1      0
## 171              0          160             0     0.0       1      0
## 172              0          160             0     0.0       1      0
## 173              0          188             0     0.0       1      0
```

```
## 174            0            162             0     0.0         1      0
## 175            0            172             0     0.0         1      0
## 176            0            134             1     2.0         2      1
## 177            0            135             1     2.0         2      1
## 178            0            105             0     1.5         2      1
## 179            0            150             0     0.0         1      0
## 180            0            150             0     0.0         1      0
## 182            0            120             1     2.0         2      1
## 183            0            150             0     0.0         1      0
## 184            0            124             1     2.0         2      1
## 185            1            140             1     1.0         2      0
## 187            1             92             0     0.0         2      1
## 188            0            110             0     0.0         1      0
## 189            0            138             1     1.0         2      1
## 191            1            120             1     1.5         2      1
## 192            1            120             0     0.0         1      0
## 193            1            116             0     0.0         1      0
## 194            0            160             0     0.0         1      0
## 195            0            110             0     0.0         1      0
## 198            0            132             0     1.0         2      0
## 199            0            136             0     0.0         1      0
## 200            0            116             1     0.0         2      1
## 202            0            150             0     0.0         1      0
## 203            0            150             0     0.0         1      0
## 204            0            146             0     0.0         1      0
## 206            0            100             0     0.0         1      0
## 207            0            140             1     0.0         1      0
## 208            2            180             0     0.0         1      0
## 209            0            140             0     0.0         2      1
## 210            2            185             0     0.0         1      0
## 211            0            140             0     0.0         2      1
## 212            0            110             0     0.0         2      1
## 214            0            128             1     1.0         1      0
## 216            0             98             1     1.5         2      1
## 218            0            150             0     0.0         2      1
## 219            0            137             0     0.0         1      0
## 220            0            150             0     0.0         1      0
## 221            0            170             0     0.0         1      0
## 222            0            112             0     0.0         2      1
## 225            0            185             0     0.0         1      0
## 226            0            137             0     0.0         1      0
## 227            0            150             0     0.0         2      1
## 228            0            140             0     0.0         1      0
## 229            0            134             1     2.5         2      1
## 230            0            170             0     0.0         1      0
## 232            0            158             0     0.0         1      0
## 233            0            167             0     0.0         1      0
## 235            0            142             0     0.0         1      0
## 237            0            160             1     1.0         2      0
## 238            0            118             1     3.0         2      1
```

```
## 239            0           136            0     0.0       2      1
## 240            0            99            1     2.0       2      1
## 241            0           102            1     3.0       2      1
## 242            0           155            0     0.0       1      0
## 243            0           142            1     2.0       2      1
## 244            0           143            1     2.0       2      1
## 246            0           103            1     1.0       2      1
## 247            0           137            0     2.0       1      0
## 248            0           150            1     1.5       2      1
## 249            1           150            1     2.0       3      1
## 250            1           130            1     1.0       2      1
## 251            0           120            1     1.0       2      1
## 252            0           135            0     0.0       2      1
## 253            0           115            0     2.0       2      1
## 254            1           115            1     0.0       1      0
## 255            0           152            0     1.0       1      0
## 256            0            96            1     2.0       2      1
## 259            0           172            0     0.0       1      0
## 262            0           165            1     0.0       1      0
## 264            0           115            1     0.0       2      1
## 265            0           125            0     0.0       2      1
## 266            0           145            1     1.0       2      1
## 267            0           175            0     0.0       1      0
## 268            0           110            1     1.0       2      1
## 269            0           150            0     0.0       1      0
## 270            0            91            1     1.0       2      1
## 272            0           140            0     0.0       1      0
## 274            0           130            1     3.0       2      1
## 275            2           134            0     0.0       1      0
## 277            0           100            0     0.0       1      0
## 278            0           150            0     2.0       2      1
## 279            0           126            1     1.5       2      1
## 282            2           135            0     0.0       1      0
## 283            0           122            0     2.0       2      1
## 286            0           170            0     0.0       1      0
## 288            0           140            0     0.0       1      0
## 289            0           132            0     0.0       1      0
## 291            0           180            0     0.0       1      0
## 292            0           138            0     0.0       1      0
## 294            0           148            0     0.0       1      0
## 418            1           112            1     3.0       2      1
## 419            1           127            0     0.0       1      0
## 420            1           140            1     1.5       3      1
## 421            1           149            1     2.5       1      1
## 422            2            99            1     1.3       2      0
## 424            1           105            1     0.0       2      1
## 427            1           157            0     0.5       2      1
## 428            1           140            0     0.0       1      0
## 433            1            86            0     0.0       1      0
## 434            0            84            1     2.5       3      1
```

```
## 435                0             125                  1      2.0           2       1
## 445                1             140                  1      0.5           2       1
## 446                0             120                  1      1.5           2       1
## 447                1             124                  1      1.6           2       1
## 449                1             110                  1      2.0           1       1
## 450                0             105                  1      1.0           2       1
## 454                1             118                  1      1.5           2       1
## 456                0             123                  1      1.2           2       1
## 462                1             118                  1      1.9           2       1
## 464                0             117                  1      1.3           3       1
## 467                0             160                  0      0.0           1       0
## 470                1              97                  1      1.6           1       1
## 471                0             161                  0      2.0           2       0
## 475                1             122                  1      1.7           2       1
## 478                2             139                  0      0.1           1       0
## 480                1             148                  1      2.0           2       1
## 484                0             125                  0      2.5           1       1
## 487                1             128                  1      1.2           2       1
## 488                1             180                  0      0.4           1       0
## 489                1             144                  1      2.0           2       1
## 490                0             135                  0      0.3           1       0
## 491                0             140                  1      3.0           2       1
## 492                0             102                  1      1.0           2       1
## 493                1             108                  0      0.0           2       1
## 495                0             127                  1      1.7           2       1
## 496                0             110                  1      2.5           2       1
## 498                0              69                  0      1.0           3       0
## 499                0             148                  1      3.0           3       1
## 500                1             130                  1      0.0           2       1
## 501                0             130                  1      1.0           2       1
## 502                0             140                  1      4.0           3       1
## 503                0             138                  1      2.0           2       1
## 504                1             140                  1      2.0           2       1
## 505                1             138                  0      0.2           1       0
## 506                0             112                  1      3.0           3       1
## 507                1             131                  1      1.2           2       1
## 508                0             112                  1      3.0           2       1
## 509                0              80                  1      0.0           1       0
## 511                0             110                  0      0.0           2       1
## 512                0             126                  0      0.3           1       0
## 513                1              88                  1      2.0           2       1
## 514                1             153                  0     -0.1           1       0
## 515                1             150                  1      1.3           2       1
## 518                0             132                  0      0.0           0       1
## 519                0             120                  1      1.5           2       1
## 521                1             121                  1      1.0           1       1
## 522                1             128                  0      0.5           2       0
## 523                1             135                  1      4.0           3       1
## 524                2             120                  1      1.0           1       1
## 525                0             117                  1      1.0           2       1
```

```
## 526                  1            150                0      0.0           1       0
## 527                  0            144                0      0.1           1       0
## 528                  2            113                1      1.7           2       1
## 529                  0            135                0      0.3           1       0
## 530                  0            127                1      1.5           2       1
## 531                  0            109                1      1.4           2       1
## 532                  0            128                1      1.1           2       1
## 533                  1            115                1      1.8           2       1
## 534                  1            102                0      0.0           2       1
## 535                  1            140                1      2.0           2       1
## 536                  0            135                1      2.5           3       1
## 539                  1            130                1      4.0           3       1
## 540                  0            112                1      2.0           2       1
## 541                  2            100                0      0.0           1       0
## 542                  1            122                1      1.2           2       1
## 543                  2            120                0      3.5           3       1
## 545                  1            129                1      3.0           3       1
## 547                  1            139                0      0.2           1       0
## 548                  1            162                0      0.0           2       1
## 549                  1            100                0      1.5           3       1
## 550                  0            140                0      1.5           1       1
## 551                  1            135                0      0.2           1       0
## 552                  0             73                0      2.0           2       1
## 553                  2             86                0      0.0           1       0
## 554                  0            108                1      1.8           2       1
## 555                  0            116                1      1.8           2       1
## 556                  1            160                0      0.3           1       0
## 557                  1            118                1      0.0           2       1
## 558                  0            112                1      2.0           3       0
## 559                  1            122                1      1.8           2       1
## 560                  1            124                1      1.4           2       1
## 561                  0            102                1      4.0           3       1
## 562                  1            137                0      0.2           1       0
## 563                  1            141                0      0.1           1       0
## 564                  0            154                1      2.0           2       0
## 565                  1            126                1      1.1           2       1
## 566                  1            160                1      2.0           2       1
## 567                  1            115                1      1.7           2       1
## 568                  0            128                1      1.5           2       0
## 569                  1            115                1      0.0           2       1
## 570                  0            105                1      1.5           3       1
## 571                  0            110                1      2.5           2       1
## 572                  1            119                1      2.0           3       1
## 573                  0            109                1      1.5           2       1
## 574                  1            135                1      0.5           2       1
## 575                  2            130                0      1.5           2       1
## 576                  1            112                1      1.5           2       1
## 577                  0            126                1      1.2           2       1
## 578                  1            120                1      3.0           2       1
## 579                  0            110                1      1.9           2       1
```

```
## 580                  2            119                 1      3.0          3       1
## 581                  1            110                 1      1.8          2       1
## 582                  2            130                 1      1.0          2       1
## 583                  0            159                 1      1.5          1       1
## 584                  2             84                 1      0.0          2       1
## 585                  2            126                 0      0.3          1       0
## 586                  1            116                 1      1.5          2       1
## 587                  1            120                 0      0.8          2       1
## 588                  0            122                 1      2.0          2       1
## 589                  2            165                 0      1.0          2       0
## 590                  1            122                 1      2.0          2       1
## 591                  0             94                 0      0.0          2       1
## 592                  1            133                 0      0.2          1       0
## 593                  1            110                 0      0.0          1       0
## 594                  2            150                 1      2.0          3       1
## 595                  2            130                 0      0.0          2       1
## 596                  2            113                 1      1.0          1       1
## 597                  2            140                 1      0.5          2       1
## 598                  2            100                 0      0.0          2       1
## 599                  1            136                 0      0.2          1       0
## 600                  2            127                 1      1.7          3       1
## 601                  0             98                 0      1.5          2       1
## 602                  1             96                 1      1.0          2       0
## 603                  0            123                 1      1.3          2       1
## 604                  0             98                 1      0.0          2       1
## 605                  1            118                 1      0.0          2       1
## 606                  0            112                 1      1.5          3       1
## 607                  0            151                 1      0.0          1       0
## 609                  1            108                 1      3.0          2       1
## 610                  1            128                 1      1.5          2       1
## 611                  1            138                 1      0.0          2       1
## 612                  0            126                 0      0.0          2       1
## 614                  1            137                 0      0.2          1       0
## 615                  1            100                 0      0.0          2       1
## 616                  2            135                 0      0.3          1       0
## 617                  2             93                 1      0.0          2       1
## 618                  2            109                 0      2.4          2       1
## 620                  0            141                 0      0.3          1       1
## 621                  0            105                 1      0.2          2       0
## 623                  0            140                 0      0.4          1       0
## 624                  2            142                 1      0.6          2       1
## 625                  2            142                 1      1.2          2       1
## 626                  2            170                 0      1.2          2       1
## 628                  0            161                 0      0.5          2       0
## 629                  2            111                 1      0.0          1       0
## 630                  2            180                 0      0.0          1       0
## 631                  0            145                 0      2.6          2       1
## 634                  0            120                 1      1.8          2       1
## 635                  2            155                 1      3.1          3       1
## 636                  2            144                 1      1.8          2       0
```

```
## 637             0            178                 1      1.4          1      0
## 638             2            129                 1      2.6          2      1
## 639             2            180                 0      0.2          2      0
## 640             0            181                 0      1.2          2      0
## 641             0            143                 0      0.1          1      0
## 646             2            165                 0      2.5          2      1
## 648             2            150                 0      0.4          2      1
## 649             2            138                 0      2.3          1      0
## 651             2            140                 1      3.4          3      1
## 652             2            126                 1      0.9          2      1
## 653             2            150                 1      0.0          1      1
## 654             2            138                 1      1.9          1      1
## 655             2            125                 0      0.0          1      1
## 656             0            150                 0      0.0          1      0
## 657             2            186                 0      0.0          1      0
## 658             0            181                 0      0.0          1      1
## 660             0            179                 1      0.4          1      0
## 661             0            156                 0      0.0          1      0
## 662             0            134                 0      2.2          2      1
## 663             2            165                 0      0.0          1      0
## 664             2            126                 0      0.8          1      1
## 665             2            177                 0      0.0          1      1
## 666             0            120                 1      0.0          2      1
## 668             0            125                 1      1.8          2      1
## 669             0            184                 0      0.0          1      0
## 674             2            125                 1      3.6          2      1
## 677             2            103                 0      1.4          2      1
## 678             0            173                 0      0.2          1      0
## 680             0            169                 0      0.0          1      0
## 682             2            150                 0      2.3          3      0
## 683             2            112                 1      0.6          2      1
## 684             2            186                 1      0.0          1      0
## 687             0            152                 0      0.0          1      1
## 688             0            140                 1      3.6          2      1
## 690             2            143                 0      0.0          1      0
## 693             2            147                 1      0.0          2      1
## 694             2            148                 1      3.0          2      0
## 697             0            178                 0      0.8          1      0
## 698             0            105                 0      2.0          2      1
## 699             0            130                 1      1.6          2      1
## 700             2            111                 1      0.8          1      1
## 701             2            168                 0      2.0          2      0
## 702             0            126                 1      1.5          2      0
## 703             2            178                 0      0.8          1      0
## 704             2            140                 0      0.0          1      0
## 705             2            145                 0      4.2          3      0
## 707             2            128                 0      2.6          2      1
## 708             0            164                 1      0.0          1      0
## 710             2            109                 1      2.2          2      1
## 711             2            108                 1      0.0          2      1
```

```
## 712                 0            168                 0      1.0          1       1
## 713                 2            118                 1      1.0          2       1
## 714                 2            151                 0      0.4          2       0
## 715                 0            156                 0      0.1          1       1
## 719                 0             71                 0      1.0          2       1
## 721                 2            124                 0      1.0          2       1
## 722                 2            147                 0      1.4          2       1
## 723                 2            166                 0      0.5          2       1
## 724                 0            143                 1      1.2          2       0
## 726                 0            162                 1      0.0          1       1
## 729                 0            153                 0      0.0          1       0
## 732                 0            162                 0      0.0          1       0
## 734                 2            144                 0      0.8          1       1
## 737                 2            103                 1      1.6          3       1
## 738                 0            139                 0      2.0          2       1
## 739                 2            116                 1      3.2          2       1
## 740                 0             88                 1      1.2          2       1
## 742                 2            152                 0      0.5          3       0
## 744                 0             99                 1      1.8          2       1
## 746                 0            158                 0      0.8          1       0
## 747                 0            160                 1      1.4          1       1
## 749                 2            132                 1      0.1          1       1
## 750                 0            178                 0      0.0          1       0
## 751                 2             96                 1      2.2          3       1
## 752                 2            165                 0      1.6          1       0
## 755                 2            144                 1      1.2          2       1
## 757                 0            168                 1      0.0          1       0
## 758                 2            132                 0      2.0          2       1
## 759                 2            182                 0      0.0          1       0
## 760                 0            163                 0      0.6          2       1
## 761                 2            125                 1      1.4          1       0
## 762                 2            195                 0      0.0          1       1
## 763                 0             95                 1      2.0          2       1
## 764                 0            160                 0      0.0          1       1
## 765                 2            114                 1      2.0          2       1
## 766                 2            173                 0      3.2          1       1
## 768                 0            179                 0      0.0          1       0
## 774                 0            111                 1      5.6          3       1
## 775                 2            170                 0      0.0          1       0
## 776                 2            162                 0      1.9          2       0
## 778                 0            182                 1      3.8          2       1
## 780                 0            155                 0      0.0          1       0
## 781                 2            130                 1      3.0          2       1
## 782                 0            161                 0      0.0          1       0
## 785                 2            152                 0      1.2          3       0
## 787                 2            174                 0      1.4          2       1
## 788                 2            131                 0      0.1          2       0
## 789                 2            146                 0      2.0          2       1
## 790                 2            125                 1      0.9          2       1
## 792                 2            174                 0      0.0          1       0
```

```
## 794           0         122        1    4.2      2    1
## 795           0         147        0    3.6      2    1
## 796           0         163        0    0.2      2    1
## 797           0         163        0    0.0      1    0
## 798           0         194        0    0.8      3    0
## 800           2         158        0    0.0      1    1
## 802           2         173        0    0.0      1    0
## 803           0         162        0    1.9      1    0
## 804           2         105        1    2.1      2    1
## 805           0         147        0    0.1      1    0
## 807           0         112        1    2.9      2    1
## 808           0         160        0    1.2      1    0
## 809           0         125        1    2.6      3    1
## 810           0         156        0    0.0      1    0
## 811           2         156        1    0.0      1    1
## 812           0         175        0    0.0      1    0
## 817           2         162        1    0.0      1    1
## 818           0         151        0    1.0      1    0
## 819           2         171        0    0.0      1    1
## 820           2         141        1    2.8      2    1
## 821           0         173        1    1.6      1    1
## 822           2         145        1    0.8      2    1
## 823           0         178        0    1.2      2    0
## 825           2         154        1    0.6      2    0
## 826           0         131        1    1.8      2    1
## 827           0         187        0    3.5      3    0
## 828           2         159        0    0.2      2    1
## 829           2         166        0    2.4      2    0
## 831           2         131        1    2.2      2    1
## 832           2         202        0    0.0      1    0
## 835           0         154        1    0.0      1    0
## 836           2         147        0    0.4      2    0
## 837           0         170        0    0.0      1    0
## 838           0         126        1    2.8      2    1
## 839           2         127        0    2.8      2    1
## 840           0         174        0    1.6      1    0
## 841           2         132        1    1.8      1    1
## 843           0         132        0    0.0      2    0
## 847           2         190        0    0.0      2    0
## 849           0         140        0    1.2      2    1
## 850           2         185        0    0.0      1    0
## 851           0         161        1    0.0      1    1
## 852           0         146        0    1.8      2    0
## 855           2         120        1    2.5      2    1
## 856           2         156        0    0.0      1    0
## 857           0         172        0    0.2      1    0
## 858           2         150        1    1.6      2    1
## 859           2         182        0    0.0      1    0
## 863           0         144        1    1.4      1    1
## 864           2         158        0    0.6      1    1
```

```
## 866          2          155          0     3.0        2     1
## 867          2          142          1     2.8        2     1
## 868          0          113          0     1.4        2     1
## 869          2          188          0     0.0        1     0
## 870          2          153          0     0.0        1     1
## 871          0          123          0     0.6        1     0
## 872          0          157          0     1.6        1     0
## 874          0          137          1     1.0        2     0
## 875          0          132          1     1.2        2     1
## 876          0          158          0     0.0        1     1
## 877          0          171          0     1.5        1     0
## 879          2          132          1     2.4        2     1
## 880          2          160          0     1.8        2     1
## 881          0          171          0     0.6        1     0
## 882          0          168          0     1.0        3     1
## 883          0          162          0     0.5        1     0
## 884          0          173          0     0.0        1     0
## 886          0          148          0     0.4        2     0
## 887          2          108          1     1.5        2     1
## 888          2          150          0     2.3        3     0
## 889          2          108          1     1.5        2     1
## 890          2          129          1     2.6        2     1
## 891          0          187          0     3.5        3     0
## 893          0          178          0     0.8        1     0
## 896          2          147          0     1.4        2     1
## 897          2          155          1     3.1        3     1
## 898          0          148          0     0.4        2     0
## 900          2          142          1     0.6        2     1
## 901          0          173          0     0.0        1     0
## 902          0          162          0     0.5        1     0
## 903          0          174          0     1.6        1     0
## 904          0          168          0     1.0        3     1
## 905          0          160          0     1.2        1     0
## 907          0          171          0     0.6        1     0
## 908          2          144          1     1.8        2     0
## 910          2          160          0     1.8        2     1
## 911          2          173          0     3.2        1     1
## 912          2          132          1     2.4        2     1
## 916          0          171          0     1.5        1     0
## 917          2          114          1     2.0        2     1
## 919          0          160          1     1.4        1     1
## 920          0          158          0     0.0        1     1
## 921          0          161          0     0.5        2     0
## 922          0          179          1     0.4        1     0
## 923          0          178          0     0.0        1     0
## 924          2          120          1     2.5        2     1
## 925          2          112          1     0.6        2     1
## 926          0          132          1     1.2        2     1
## 927          0          137          1     1.0        2     0
## 929          0          178          1     1.4        1     0
```

```
## 931      0    157    0  1.6   1  0
## 933      2    165    0  2.5   2  1
## 934      0    123    0  0.6   1  0
## 935      2    128    0  2.6   2  1
## 937      2    152    0  1.2   3  0
## 939      0    140    0  0.4   1  0
## 940      2    153    0  0.0   1  1
## 941      2    188    0  0.0   1  0
## 942      0    144    1  1.4   1  1
## 943      2    109    1  2.2   2  1
## 944      0    163    0  0.6   2  1
## 945      2    158    0  0.0   1  1
## 946      2    152    0  0.5   3  0
## 947      2    125    1  1.4   1  0
## 950      2    131    1  2.2   2  1
## 952      0    113    0  1.4   2  1
## 953      2    142    1  2.8   2  1
## 954      2    155    0  3.0   2  1
## 955      2    165    0  1.6   1  0
## 956      2    140    1  3.4   3  1
## 957      0    147    0  3.6   2  1
## 959      0    163    0  0.2   2  1
## 960      0     99    1  1.8   2  1
## 961      2    158    0  0.6   1  1
## 962      2    177    0  0.0   1  1
## 964      2    141    1  2.8   2  1
## 966      2    180    0  0.2   2  0
## 967      2    111    1  0.8   1  1
## 968      2    148    1  3.0   2  0
## 970      2    182    0  0.0   1  0
## 971      2    150    1  1.6   2  1
## 972      0    172    0  0.2   1  0
## 973      2    180    0  0.0   1  0
## 974      2    156    0  0.0   1  0
## 978      2    151    0  0.4   2  0
## 980      0    146    0  1.8   2  0
## 983      0    161    1  0.0   1  1
## 984      2    142    1  1.2   2  1
## 986      0    158    0  0.8   1  0
## 987      2    186    0  0.0   1  0
## 988      2    185    0  0.0   1  0
## 989      2    174    0  0.0   1  0
## 992      0    139    0  2.0   2  1
## 993      0    156    0  0.0   1  0
## 994      0    162    1  0.0   1  1
## 995      2    150    0  0.4   2  1
## 996      0    140    1  3.6   2  1
## 997      0    140    0  1.2   2  1
## 999      2    144    1  1.2   2  1
## 1000     2    190    0  0.0   2  0
```

```
## 1003            0           132             0     0.0         2      0
## 1004            2           165             0     0.0         1      0
## 1006            2           132             1     1.8         1      1
## 1007            2           127             0     2.8         2      1
## 1008            2           150             1     0.0         1      1
## 1010            0           143             1     1.2         2      0
## 1011            0           111             1     5.6         3      1
## 1012            2           174             0     1.4         2      1
## 1015            0           126             1     2.8         2      1
## 1016            0           170             0     0.0         1      0
## 1018            2           147             0     0.4         2      0
## 1019            0           154             1     0.0         1      0
## 1020            2           202             0     0.0         1      0
## 1021            2           186             1     0.0         1      0
## 1024            0           125             1     2.6         3      1
## 1025            2           103             0     1.4         2      1
## 1026            0           130             1     1.6         2      1
## 1027            2           166             0     2.4         2      0
## 1028            0           164             1     0.0         1      0
## 1029            2           159             0     0.2         2      1
## 1030            0           184             0     0.0         1      0
## 1031            0           131             1     1.8         2      1
## 1032            2           154             1     0.6         2      0
## 1033            0           152             0     0.0         1      1
## 1034            2           124             0     1.0         2      1
## 1035            0           179             0     0.0         1      0
## 1036            2           170             0     0.0         1      0
## 1038            0           178             0     1.2         2      0
## 1041            2           145             1     0.8         2      1
## 1042            2            96             1     2.2         3      1
## 1043            2           109             0     2.4         2      1
## 1044            0           173             1     1.6         1      1
## 1045            2           171             0     0.0         1      1
## 1046            2           170             0     1.2         2      1
## 1047            0           151             0     1.0         1      0
## 1048            0           156             0     0.0         1      0
## 1049            2           162             1     0.0         1      1
## 1052            0           175             0     0.0         1      0
## 1053            0           168             1     0.0         1      0
## 1054            0           169             0     0.0         1      0
## 1056            2           156             1     0.0         1      1
## 1058            0           112             1     2.9         2      1
## 1059            2           111             1     0.0         1      0
## 1062            2           132             0     2.0         2      1
## 1063            0            88             1     1.2         2      1
## 1064            0           147             0     0.1         1      0
## 1065            2           105             1     2.1         2      1
## 1066            0           162             0     1.9         1      0
## 1067            2           173             0     0.0         1      0
## 1068            2           166             0     0.5         2      1
```

```
## 1070           2             178              0     0.8        1      0
## 1071           2             145              0     4.2        3      0
## 1074           0             194              0     0.8        3      0
## 1075           0             120              1     0.0        2      1
## 1076           2             195              0     0.0        1      1
## 1077           2             146              0     2.0        2      1
## 1078           0             163              0     0.0        1      0
## 1079           0             122              1     4.2        2      1
## 1080           2             143              1     0.1        2      1
## 1083           2             125              1     0.9        2      1
## 1084           2             131              0     0.1        2      0
## 1087           2             125              0     0.0        1      1
## 1090           0             173              0     0.2        1      0
## 1092           0             161              0     0.0        1      0
## 1093           2             147              1     0.0        2      1
## 1094           2             130              1     3.0        2      1
## 1095           2             126              1     0.9        2      1
## 1096           0             155              0     0.0        1      0
## 1099           0             182              1     3.8        2      1
## 1100           2             168              0     2.0        2      0
## 1102           0             160              0     0.0        1      1
## 1103           2             162              0     1.9        2      0
## 1107           2             182              0     0.0        1      0
## 1111           0              95              1     2.0        2      1
## 1114           0             143              0     0.1        1      0
## 1116           2             108              1     0.0        2      1
## 1117           2             132              1     0.1        1      1
## 1120           2             126              0     0.8        1      1
## 1123           2             116              1     3.2        2      1
## 1124           2             103              1     1.6        3      1
## 1125           2             144              0     0.8        1      1
## 1127           0             162              0     0.0        1      0
## 1128           0             153              0     0.0        1      0
## 1131           0             145              0     2.6        2      1
## 1133           0              71              0     1.0        2      1
## 1134           0             156              0     0.1        1      1
## 1135           2             118              1     1.0        2      1
## 1136           0             168              0     1.0        1      1
## 1137           2             140              0     0.0        1      0
## 1138           0             126              1     1.5        2      0
## 1139           0             105              0     2.0        2      1
## 1140           0             105              1     0.2        2      0
## 1142           0             181              0     1.2        2      0
## 1146           2             143              0     0.0        1      0
## 1147           0             141              0     0.3        1      1
## 1151           0             169              0     0.0        1      0
## 1152           2             125              1     3.6        2      1
## 1153           0             125              1     1.8        2      1
## 1154           0             156              1     1.0        2      1
## 1155           0             134              0     2.2        2      1
```

```
## 1156           0            181                0     0.0         1      1
## 1157           0            150                0     0.0         1      0
## 1158           2            138                1     1.9         1      1
## 1159           2            138                0     2.3         1      0
## 1160           0            120                1     1.8         2      1
## 1162           0            162                0     0.8         1      1
## 1163           2            155                0     0.6         2      0
## 1166           2            164                0     0.0         1      1
## 1168           0            143                1     3.0         2      1
## 1169           0            179                0     0.0         1      0
## 1171           0            174                0     0.0         1      0
## 1172           0            161                0     0.0         1      1
## 1173           1            140                0     4.4         3      1
## 1175           0            144                0     0.4         2      0
## 1176           2            163                0     0.0         1      0
## 1177           0            169                0     0.0         3      0
## 1178           2            150                0     0.8         2      1
## 1180           0            144                1     2.8         3      1
## 1181           2            144                1     4.0         1      1
## 1183           0            182                0     0.0         1      0
## 1184           2             90                0     1.0         2      1
## 1186           0            132                0     1.2         2      1
## 1187           0            141                0     3.4         2      1
## 1188           0            115                1     1.2         2      1
## 1190           0            173                0     0.0         1      0
```

```
heart_clean[heart_clean$chest.pain.type >= min(heart_cpt_boxplot$out), ]
```

```
##       age sex chest.pain.type resting.bp.s cholesterol fasting.blood.sugar
## 1      40   1               2          140         289                   0
## 2      49   0               3          160         180                   0
## 3      37   1               2          130         283                   0
## 4      48   0               4          138         214                   0
## 5      54   1               3          150         195                   0
## 6      39   1               3          120         339                   0
## 7      45   0               2          130         237                   0
## 8      54   1               2          110         208                   0
## 9      37   1               4          140         207                   0
## 10     48   0               2          120         284                   0
## 11     37   0               3          130         211                   0
## 12     58   1               2          136         164                   0
## 13     39   1               2          120         204                   0
## 14     49   1               4          140         234                   0
## 15     42   0               3          115         211                   0
## 16     54   0               2          120         273                   0
## 17     38   1               4          110         196                   0
## 18     43   0               2          120         201                   0
## 19     60   1               4          100         248                   0
## 20     36   1               2          120         267                   0
## 21     43   0               1          100         223                   0
```

```
## 22    44   1          2       120      184        0
## 23    49   0          2       124      201        0
## 24    44   1          2       150      288        0
## 25    40   1          3       130      215        0
## 26    36   1          3       130      209        0
## 27    53   1          4       124      260        0
## 28    52   1          2       120      284        0
## 29    53   0          2       113      468        0
## 30    51   1          2       125      188        0
## 31    53   1          3       145      518        0
## 32    56   1          3       130      167        0
## 33    54   1          4       125      224        0
## 34    41   1          4       130      172        0
## 35    43   0          2       150      186        0
## 36    32   1          2       125      254        0
## 37    65   1          4       140      306        1
## 38    41   0          2       110      250        0
## 39    48   0          2       120      177        1
## 40    48   0          4       150      227        0
## 41    54   0          2       150      230        0
## 42    54   0          3       130      294        0
## 43    35   1          2       150      264        0
## 44    52   1          3       140      259        0
## 45    43   1          4       120      175        0
## 46    59   1          3       130      318        0
## 47    37   1          4       120      223        0
## 48    50   1          2       140      216        0
## 49    36   1          3       112      340        0
## 50    41   1          4       110      289        0
## 51    50   1          4       130      233        0
## 52    47   0          4       120      205        0
## 53    45   1          2       140      224        1
## 54    41   0          2       130      245        0
## 55    52   0          4       130      180        0
## 56    51   0          2       160      194        0
## 57    31   1          4       120      270        0
## 58    58   1          3       130      213        0
## 59    54   1          4       150      365        0
## 60    52   1          4       112      342        0
## 61    49   1          2       100      253        0
## 62    43   0          3       150      254        0
## 63    45   1          4       140      224        0
## 64    46   1          4       120      277        0
## 65    50   0          2       110      202        0
## 66    37   0          2       120      260        0
## 67    45   0          4       132      297        0
## 68    32   1          2       110      225        0
## 69    52   1          4       160      246        0
## 70    44   1          4       150      412        0
## 71    57   1          2       140      265        0
```

```
## 72    44   1                2           130          215                    0
## 73    52   1                4           120          182                    0
## 74    44   0                4           120          218                    0
## 75    55   1                4           140          268                    0
## 76    46   1                3           150          163                    0
## 77    32   1                4           118          529                    0
## 78    35   0                4           140          167                    0
## 79    52   1                2           140          100                    0
## 80    49   1                4           130          206                    0
## 81    55   1                3           110          277                    0
## 82    54   1                2           120          238                    0
## 83    63   1                4           150          223                    0
## 84    52   1                2           160          196                    0
## 85    56   1                4           150          213                    1
## 86    66   1                4           140          139                    0
## 87    65   1                4           170          263                    1
## 88    53   0                2           140          216                    0
## 89    43   1                1           120          291                    0
## 90    55   1                4           140          229                    0
## 91    49   0                2           110          208                    0
## 92    39   1                4           130          307                    0
## 93    52   0                2           120          210                    0
## 94    48   1                4           160          329                    0
## 95    39   0                3           110          182                    0
## 96    58   1                4           130          263                    0
## 97    43   1                2           142          207                    0
## 98    39   1                3           160          147                    1
## 99    56   1                4           120           85                    0
## 100   41   1                2           125          269                    0
## 101   65   1                4           130          275                    0
## 102   51   1                4           130          179                    0
## 103   40   0                4           150          392                    0
## 104   40   1                4           120          466                    1
## 105   46   1                4           118          186                    0
## 106   57   1                2           140          260                    1
## 107   48   0                4           120          254                    0
## 108   34   1                2           150          214                    0
## 109   50   1                4           140          129                    0
## 110   39   1                2           190          241                    0
## 111   59   0                2           130          188                    0
## 112   57   1                4           150          255                    0
## 113   47   1                4           140          276                    1
## 114   38   1                2           140          297                    0
## 115   49   0                3           130          207                    0
## 116   33   0                4           100          246                    0
## 117   38   1                4           120          282                    0
## 118   59   0                4           130          338                    1
## 119   35   0                1           120          160                    0
## 120   34   1                1           140          156                    0
## 121   47   0                3           135          248                    1
```

```
## 122   52   0                3         125         272                 0
## 123   46   1                4         110         240                 0
## 124   58   0                2         180         393                 0
## 125   58   1                2         130         230                 0
## 126   54   1                2         120         246                 0
## 127   34   0                2         130         161                 0
## 128   48   0                4         108         163                 0
## 129   54   0                2         120         230                 1
## 130   42   1                3         120         228                 0
## 131   38   1                3         145         292                 0
## 132   46   1                4         110         202                 0
## 133   56   1                4         170         388                 0
## 134   56   1                4         150         230                 0
## 135   61   0                4         130         294                 0
## 136   49   1                3         115         265                 0
## 137   43   0                2         120         215                 0
## 138   39   1                2         120         241                 0
## 139   54   1                4         140         166                 0
## 140   43   1                4         150         247                 0
## 141   52   1                4         160         331                 0
## 142   50   1                4         140         341                 0
## 143   47   1                4         160         291                 0
## 144   53   1                4         140         243                 0
## 145   56   0                2         120         279                 0
## 146   39   1                4         110         273                 0
## 147   42   1                2         120         198                 0
## 148   43   0                2         120         249                 0
## 149   50   1                2         120         168                 0
## 150   54   1                4         130         603                 1
## 151   39   1                2         130         215                 0
## 152   48   1                2         100         159                 0
## 153   40   1                2         130         275                 0
## 154   55   1                4         120         270                 0
## 155   41   1                2         120         291                 0
## 156   56   1                4         155         342                 1
## 157   38   1                4         110         190                 0
## 158   49   1                4         140         185                 0
## 159   44   1                4         130         290                 0
## 160   54   1                2         160         195                 0
## 161   59   1                4         140         264                 1
## 162   49   1                4         128         212                 0
## 163   47   1                2         160         263                 0
## 164   49   0                2         110         208                 0
## 165   42   1                2         120         196                 0
## 166   52   0                2         140         225                 0
## 167   46   1                1         140         272                 1
## 168   50   1                4         140         231                 0
## 169   48   1                2         140         238                 0
## 170   58   1                4         135         222                 0
## 171   58   1                3         140         179                 0
```

```
## 172   29   1                2             120            243                    0
## 173   40   1                3             140            235                    0
## 174   53   1                2             140            320                    0
## 175   49   1                3             140            187                    0
## 176   52   1                4             140            266                    0
## 177   43   1                4             140            288                    0
## 178   54   1                4             140            216                    0
## 179   59   1                2             140            287                    0
## 180   37   1                3             130            194                    0
## 181   46   0                4             130            238                    0
## 182   52   1                4             130            225                    0
## 183   51   1                2             130            224                    0
## 184   52   1                4             140            404                    0
## 185   46   1                4             110            238                    0
## 186   54   0                2             160            312                    0
## 187   58   1                3             160            211                    1
## 188   58   1                2             130            251                    0
## 189   41   1                4             120            237                    1
## 190   50   0                4             120            328                    0
## 191   53   1                4             180            285                    0
## 192   46   1                4             180            280                    0
## 193   50   1                2             170            209                    0
## 194   48   1                2             130            245                    0
## 195   45   1                3             135            192                    0
## 196   41   0                2             125            184                    0
## 197   62   0                1             160            193                    0
## 198   49   1                4             120            297                    0
## 199   42   1                2             150            268                    0
## 200   53   1                4             120            246                    0
## 201   57   0                1             130            308                    0
## 202   47   1                1             110            249                    0
## 203   46   1                3             120            230                    0
## 204   42   1                3             160            147                    0
## 205   31   0                2             100            219                    0
## 206   56   1                2             130            184                    0
## 207   50   1                4             150            215                    0
## 208   35   1                2             120            308                    0
## 209   35   1                2             110            257                    0
## 210   28   1                2             130            132                    0
## 211   54   1                4             125            216                    0
## 212   48   1                4             106            263                    1
## 213   50   0                3             140            288                    0
## 214   56   1                3             130            276                    0
## 215   56   0                3             130            219                    0
## 216   47   1                4             150            226                    0
## 217   30   0                1             170            237                    0
## 218   39   1                4             110            280                    0
## 219   54   1                3             120            217                    0
## 220   55   1                2             140            196                    0
## 221   29   1                2             140            263                    0
```

```
## 222   46   1              4           130          222                0
## 223   51   0              4           160          303                0
## 224   48   0              3           120          195                0
## 225   33   1              3           120          298                0
## 226   55   1              2           120          256                1
## 227   50   1              4           145          264                0
## 228   53   1              3           120          195                0
## 229   38   1              4            92          117                0
## 230   41   1              2           120          295                0
## 231   37   0              4           130          173                0
## 232   37   1              4           130          315                0
## 233   40   1              3           130          281                0
## 234   38   0              2           120          275                0
## 235   41   1              4           112          250                0
## 236   54   0              2           140          309                0
## 237   39   1              2           120          200                0
## 238   41   1              4           120          336                0
## 239   55   1              1           140          295                0
## 240   48   1              4           160          355                0
## 241   48   1              4           160          193                0
## 242   55   1              2           145          326                0
## 243   54   1              4           200          198                0
## 244   55   1              2           160          292                1
## 245   43   0              2           120          266                0
## 246   48   1              4           160          268                0
## 247   54   1              1           120          171                0
## 248   54   1              3           120          237                0
## 249   48   1              4           122          275                1
## 250   45   1              4           130          219                0
## 251   49   1              4           130          341                0
## 252   44   1              4           135          491                0
## 253   48   1              4           120          260                0
## 254   61   1              4           125          292                0
## 255   62   1              2           140          271                0
## 256   55   1              4           145          248                0
## 257   53   0              3           120          274                0
## 258   55   0              2           130          394                0
## 259   36   1              3           150          160                0
## 260   51   0              3           150          200                0
## 261   55   0              2           122          320                0
## 262   46   1              2           140          275                0
## 263   54   0              2           120          221                0
## 264   46   1              4           120          231                0
## 265   59   1              4           130          126                0
## 266   47   1              3           140          193                0
## 267   54   1              2           160          305                0
## 268   52   1              4           130          298                0
## 269   34   1              2            98          220                0
## 270   54   1              4           130          242                0
## 271   47   0              3           130          235                0
```

```
## 272   45   1              4         120         225                0
## 273   32   0              2         105         198                0
## 274   55   1              4         140         201                0
## 275   55   1              3         120         220                0
## 276   45   0              2         180         295                0
## 277   59   1              3         180         213                0
## 278   51   1              3         135         160                0
## 279   52   1              4         170         223                0
## 280   57   0              4         180         347                0
## 281   54   0              2         130         253                0
## 282   60   1              3         120         246                0
## 283   49   1              4         150         222                0
## 284   51   0              3         130         220                0
## 285   55   0              2         110         344                0
## 286   42   1              4         140         358                0
## 287   51   0              3         110         190                0
## 288   59   1              4         140         169                0
## 289   53   1              2         120         181                0
## 290   48   0              2         133         308                0
## 291   36   1              2         120         166                0
## 292   48   1              3         110         211                0
## 293   47   0              2         140         257                0
## 294   53   1              4         130         182                0
## 418   63   1              4         140         260                0
## 419   44   1              4         130         209                0
## 420   60   1              4         132         218                0
## 421   55   1              4         142         228                0
## 422   66   1              3         110         213                1
## 424   65   1              4         150         236                1
## 427   60   1              2         160         267                1
## 428   56   1              2         126         166                0
## 433   62   1              4         120         220                0
## 434   63   1              4         170         177                0
## 435   46   1              4         110         236                0
## 445   60   1              4         130         186                1
## 446   56   1              4         120         100                0
## 447   55   1              3         136         228                0
## 449   77   1              4         124         171                0
## 450   63   1              4         160         230                1
## 454   60   1              4         140         281                0
## 456   58   1              4         136         203                1
## 462   57   1              4         139         277                1
## 464   59   1              4         122         233                0
## 467   42   1              3         134         240                0
## 470   62   1              4         152         153                0
## 471   56   1              2         124         224                1
## 475   60   1              3         141         316                1
## 478   51   1              4         132         218                1
## 480   57   1              4         130         311                1
## 484   67   1              1         142         270                1
```

```
## 487   63  1                2            139          217                    1
## 488   55  1                2            110          214                    1
## 489   57  1                4            140          214                    0
## 490   65  1                1            140          252                    0
## 491   54  1                4            136          220                    0
## 492   72  1                3            120          214                    0
## 493   75  1                4            170          203                    1
## 495   51  1                3            137          339                    0
## 496   60  1                4            142          216                    0
## 497   64  0                4            142          276                    0
## 498   58  1                4            132          458                    1
## 499   61  1                4            146          241                    0
## 500   67  1                4            160          384                    1
## 501   62  1                4            135          297                    0
## 502   65  1                4            136          248                    0
## 503   63  1                4            130          308                    0
## 504   69  1                4            140          208                    0
## 505   51  1                4            132          227                    1
## 506   62  1                4            158          210                    1
## 507   55  1                3            136          245                    1
## 508   75  1                4            136          225                    0
## 509   40  1                3            106          240                    0
## 511   58  1                4            110          198                    0
## 512   60  1                4            136          195                    0
## 513   63  1                4            160          267                    1
## 514   35  1                3            123          161                    0
## 515   62  1                1            112          258                    0
## 518   68  1                3            150          195                    1
## 519   65  1                4            150          235                    0
## 521   63  1                4             96          305                    0
## 522   64  1                4            130          223                    0
## 523   61  1                4            120          282                    0
## 524   50  1                4            144          349                    0
## 525   59  1                4            124          160                    0
## 526   55  1                4            150          160                    0
## 527   45  1                3            130          236                    0
## 528   65  1                4            144          312                    0
## 529   61  1                2            139          283                    0
## 530   49  1                3            131          142                    0
## 531   72  1                4            143          211                    0
## 532   50  1                4            133          218                    0
## 533   64  1                4            143          306                    1
## 534   55  1                4            116          186                    1
## 535   63  1                4            110          252                    0
## 536   59  1                4            125          222                    0
## 539   74  1                4            150          258                    1
## 540   54  1                4            130          202                    1
## 541   57  1                4            110          197                    0
## 542   62  1                3            138          204                    0
## 543   76  1                3            104          113                    0
```

## 544	54	0	4	138	274	0
## 545	70	1	4	170	192	0
## 546	61	0	2	140	298	1
## 547	48	1	4	132	272	0
## 548	48	1	3	132	220	1
## 549	61	1	1	142	200	1
## 550	66	1	4	112	261	0
## 551	68	1	1	139	181	1
## 552	55	1	4	172	260	0
## 553	62	1	3	120	220	0
## 554	71	1	3	144	221	0
## 555	74	1	1	145	216	1
## 556	53	1	3	155	175	1
## 557	58	1	3	150	219	0
## 558	75	1	4	160	310	1
## 559	56	1	3	137	208	1
## 560	58	1	3	137	232	0
## 561	64	1	4	134	273	0
## 562	54	1	3	133	203	0
## 563	54	1	2	132	182	0
## 564	59	1	4	140	274	0
## 565	55	1	4	135	204	1
## 566	57	1	4	144	270	1
## 567	61	1	4	141	292	0
## 568	41	1	4	150	171	0
## 569	71	1	4	130	221	0
## 570	38	1	4	110	289	0
## 571	55	1	4	158	217	0
## 572	56	1	4	128	223	0
## 573	69	1	4	140	110	1
## 574	64	1	4	150	193	0
## 575	72	1	4	160	123	1
## 576	69	1	4	142	210	1
## 577	56	1	4	137	282	1
## 578	62	1	4	139	170	0
## 579	67	1	4	146	369	0
## 580	57	1	4	156	173	0
## 581	69	1	4	145	289	1
## 582	51	1	4	131	152	1
## 583	48	1	4	140	208	0
## 584	69	1	4	122	216	1
## 585	69	1	3	142	271	0
## 586	64	1	4	141	244	1
## 587	57	1	2	180	285	1
## 588	53	1	4	124	243	0
## 589	37	1	3	118	240	0
## 590	67	1	4	140	219	0
## 591	74	1	3	140	237	1
## 592	63	1	2	136	165	0
## 593	58	1	4	100	213	0

```
## 594   61   1                4           190          287                    1
## 595   64   1                4           130          258                    1
## 596   58   1                4           160          256                    1
## 597   60   1                4           130          186                    1
## 598   57   1                4           122          264                    0
## 599   55   1                3           133          185                    0
## 600   55   1                4           120          226                    0
## 601   56   1                4           130          203                    1
## 602   57   1                4           130          207                    0
## 603   61   1                3           140          284                    0
## 604   61   1                3           120          337                    0
## 605   58   1                3           150          219                    0
## 606   74   1                4           155          310                    0
## 607   68   1                3           134          254                    1
## 608   51   0                4           114          258                    1
## 609   62   1                4           160          254                    1
## 610   53   1                4           144          300                    1
## 611   62   1                4           158          170                    0
## 612   46   1                4           134          310                    0
## 613   54   0                4           127          333                    1
## 614   62   1                1           135          139                    0
## 615   55   1                4           122          223                    1
## 616   58   1                4           140          385                    1
## 617   62   1                2           120          254                    0
## 618   70   1                4           130          322                    0
## 619   67   0                3           115          564                    0
## 620   57   1                2           124          261                    0
## 621   64   1                4           128          263                    0
## 622   74   0                2           120          269                    0
## 623   65   1                4           120          177                    0
## 624   56   1                3           130          256                    1
## 625   59   1                4           110          239                    0
## 626   60   1                4           140          293                    0
## 627   63   0                4           150          407                    0
## 628   59   1                4           135          234                    0
## 629   53   1                4           142          226                    0
## 630   44   1                3           140          235                    0
## 631   61   1                1           134          234                    0
## 632   57   0                4           128          303                    0
## 633   71   0                4           112          149                    0
## 634   46   1                4           140          311                    0
## 635   53   1                4           140          203                    1
## 636   64   1                1           110          211                    0
## 637   40   1                1           140          199                    0
## 638   67   1                4           120          229                    0
## 639   48   1                2           130          245                    0
## 640   43   1                4           115          303                    0
## 641   47   1                4           112          204                    0
## 642   54   0                2           132          288                    1
## 643   48   0                3           130          275                    0
```

```
## 644   46   0                4           138           243                 0
## 645   51   0                3           120           295                 0
## 646   58   1                3           112           230                 0
## 647   71   0                3           110           265                 1
## 648   57   1                3           128           229                 0
## 649   66   1                4           160           228                 0
## 650   37   0                3           120           215                 0
## 651   59   1                4           170           326                 0
## 652   50   1                4           144           200                 0
## 653   48   1                4           130           256                 1
## 654   61   1                4           140           207                 0
## 655   59   1                1           160           273                 0
## 656   42   1                3           130           180                 0
## 657   48   1                4           122           222                 0
## 658   40   1                4           152           223                 0
## 659   62   0                4           124           209                 0
## 660   44   1                3           130           233                 0
## 661   46   1                2           101           197                 1
## 662   59   1                3           126           218                 1
## 663   58   1                3           140           211                 1
## 664   49   1                3           118           149                 0
## 665   44   1                4           110           197                 0
## 666   66   1                2           160           246                 0
## 667   65   0                4           150           225                 0
## 668   42   1                4           136           315                 0
## 669   52   1                2           128           205                 1
## 670   65   0                3           140           417                 1
## 671   63   0                2           140           195                 0
## 672   45   0                2           130           234                 0
## 673   41   0                2           105           198                 0
## 674   61   1                4           138           166                 0
## 675   60   0                3           120           178                 1
## 676   59   0                4           174           249                 0
## 677   62   1                2           120           281                 0
## 678   57   1                3           150           126                 1
## 679   51   0                4           130           305                 0
## 680   44   1                3           120           226                 0
## 681   60   0                1           150           240                 0
## 682   63   1                1           145           233                 1
## 683   57   1                4           150           276                 0
## 684   51   1                4           140           261                 0
## 685   58   0                2           136           319                 1
## 686   44   0                3           118           242                 0
## 687   47   1                3           108           243                 0
## 688   61   1                4           120           260                 0
## 689   57   0                4           120           354                 0
## 690   70   1                2           156           245                 0
## 691   76   0                3           140           197                 0
## 692   67   0                4           106           223                 0
## 693   45   1                4           142           309                 0
```

```
## 694   45   1              4           104          208                  0
## 695   39   0              3            94          199                  0
## 696   42   0              3           120          209                  0
## 697   56   1              2           120          236                  0
## 698   58   1              4           146          218                  0
## 699   35   1              4           120          198                  0
## 700   58   1              4           150          270                  0
## 701   41   1              3           130          214                  0
## 702   57   1              4           110          201                  0
## 703   42   1              1           148          244                  0
## 704   62   1              2           128          208                  1
## 705   59   1              1           178          270                  0
## 706   41   0              2           126          306                  0
## 707   50   1              4           150          243                  0
## 708   59   1              2           140          221                  0
## 709   61   0              4           130          330                  0
## 710   54   1              4           124          266                  0
## 711   54   1              4           110          206                  0
## 712   52   1              4           125          212                  0
## 713   47   1              4           110          275                  0
## 714   66   1              4           120          302                  0
## 715   58   1              4           100          234                  0
## 716   64   0              3           140          313                  0
## 717   50   0              2           120          244                  0
## 718   44   0              3           108          141                  0
## 719   67   1              4           120          237                  0
## 720   49   0              4           130          269                  0
## 721   57   1              4           165          289                  1
## 722   63   1              4           130          254                  0
## 723   48   1              4           124          274                  0
## 724   51   1              3           100          222                  0
## 725   60   0              4           150          258                  0
## 726   59   1              4           140          177                  0
## 727   45   0              2           112          160                  0
## 728   55   0              4           180          327                  0
## 729   41   1              2           110          235                  0
## 730   60   0              4           158          305                  0
## 731   54   0              3           135          304                  1
## 732   42   1              2           120          295                  0
## 733   49   0              2           134          271                  0
## 734   46   1              4           120          249                  0
## 735   56   0              4           200          288                  1
## 736   66   0              1           150          226                  0
## 737   56   1              4           130          283                  1
## 738   49   1              3           120          188                  0
## 739   54   1              4           122          286                  0
## 740   57   1              4           152          274                  0
## 741   65   0              3           160          360                  0
## 742   54   1              3           125          273                  0
## 743   54   0              3           160          201                  0
```

```
## 744    62   1                4          120          267                    0
## 745    52   0                3          136          196                    0
## 746    52   1                2          134          201                    0
## 747    60   1                4          117          230                    1
## 748    63   0                4          108          269                    0
## 749    66   1                4          112          212                    0
## 750    42   1                4          140          226                    0
## 751    64   1                4          120          246                    0
## 752    54   1                3          150          232                    0
## 753    46   0                3          142          177                    0
## 754    67   0                3          152          277                    0
## 755    56   1                4          125          249                    1
## 756    34   0                2          118          210                    0
## 757    57   1                4          132          207                    0
## 758    64   1                4          145          212                    0
## 759    59   1                4          138          271                    0
## 760    50   1                3          140          233                    0
## 761    51   1                1          125          213                    0
## 762    54   1                2          192          283                    0
## 763    53   1                4          123          282                    0
## 764    52   1                4          112          230                    0
## 765    40   1                4          110          167                    0
## 766    58   1                3          132          224                    0
## 767    41   0                3          112          268                    0
## 768    41   1                3          112          250                    0
## 769    50   0                3          120          219                    0
## 770    54   0                3          108          267                    0
## 771    64   0                4          130          303                    0
## 772    51   0                3          130          256                    0
## 773    46   0                2          105          204                    0
## 774    55   1                4          140          217                    0
## 775    45   1                2          128          308                    0
## 776    56   1                1          120          193                    0
## 777    66   0                4          178          228                    1
## 778    38   1                1          120          231                    0
## 779    62   0                4          150          244                    0
## 780    55   1                2          130          262                    0
## 781    58   1                4          128          259                    0
## 782    43   1                4          110          211                    0
## 783    64   0                4          180          325                    0
## 784    50   0                4          110          254                    0
## 785    53   1                3          130          197                    1
## 786    45   0                4          138          236                    0
## 787    65   1                1          138          282                    1
## 788    69   1                1          160          234                    1
## 789    69   1                3          140          254                    0
## 790    67   1                4          100          299                    0
## 791    68   0                3          120          211                    0
## 792    34   1                1          118          182                    0
## 793    62   0                4          138          294                    1
```

```
## 794   51   1               4         140          298                0
## 795   46   1               3         150          231                0
## 796   67   1               4         125          254                1
## 797   50   1               3         129          196                0
## 798   42   1               3         120          240                1
## 799   56   0               4         134          409                0
## 800   41   1               4         110          172                0
## 801   42   0               4         102          265                0
## 802   53   1               3         130          246                1
## 803   43   1               3         130          315                0
## 804   56   1               4         132          184                0
## 805   52   1               4         108          233                1
## 806   62   0               4         140          394                0
## 807   70   1               3         160          269                0
## 808   54   1               4         140          239                0
## 809   70   1               4         145          174                0
## 810   54   1               2         108          309                0
## 811   35   1               4         126          282                0
## 812   48   1               3         124          255                1
## 813   55   0               2         135          250                0
## 814   58   0               4         100          248                0
## 815   54   0               3         110          214                0
## 816   69   0               1         140          239                0
## 817   77   1               4         125          304                0
## 818   68   1               3         118          277                0
## 819   58   1               4         125          300                0
## 820   60   1               4         125          258                0
## 821   51   1               4         140          299                0
## 822   55   1               4         160          289                0
## 823   52   1               1         152          298                1
## 824   60   0               3         102          318                0
## 825   58   1               3         105          240                0
## 826   64   1               3         125          309                0
## 827   37   1               3         130          250                0
## 828   59   1               1         170          288                0
## 829   51   1               3         125          245                1
## 830   43   0               3         122          213                0
## 831   58   1               4         128          216                0
## 832   29   1               2         130          204                0
## 833   41   0               2         130          204                0
## 834   63   0               3         135          252                0
## 835   51   1               3          94          227                0
## 836   54   1               3         120          258                0
## 837   44   1               2         120          220                0
## 838   54   1               4         110          239                0
## 839   65   1               4         135          254                0
## 840   57   1               3         150          168                0
## 841   63   1               4         130          330                1
## 842   35   0               4         138          183                0
## 843   41   1               2         135          203                0
```

```
## 844   62  0            3        130        263         0
## 845   43  0            4        132        341         1
## 846   58  0            1        150        283         1
## 847   52  1            1        118        186         0
## 848   61  0            4        145        307         0
## 849   39  1            4        118        219         0
## 850   45  1            4        115        260         0
## 851   52  1            4        128        255         0
## 852   62  1            3        130        231         0
## 853   62  0            4        160        164         0
## 854   53  0            4        138        234         0
## 855   43  1            4        120        177         0
## 856   47  1            3        138        257         0
## 857   52  1            2        120        325         0
## 858   68  1            3        180        274         1
## 859   39  1            3        140        321         0
## 860   53  0            4        130        264         0
## 861   62  0            4        140        268         0
## 862   51  0            3        140        308         0
## 863   60  1            4        130        253         0
## 864   65  1            4        110        248         0
## 865   65  0            3        155        269         0
## 866   60  1            3        140        185         0
## 867   60  1            4        145        282         0
## 868   54  1            4        120        188         0
## 869   44  1            2        130        219         0
## 870   44  1            4        112        290         0
## 871   51  1            3        110        175         0
## 872   59  1            3        150        212         1
## 873   71  0            2        160        302         0
## 874   61  1            3        150        243         1
## 875   55  1            4        132        353         0
## 876   64  1            3        140        335         0
## 877   43  1            4        150        247         0
## 878   58  0            3        120        340         0
## 879   60  1            4        130        206         0
## 880   58  1            2        120        284         0
## 881   49  1            2        130        266         0
## 882   48  1            2        110        229         0
## 883   52  1            3        172        199         1
## 884   44  1            2        120        263         0
## 885   56  0            2        140        294         0
## 886   57  1            4        140        192         0
## 887   67  1            4        160        286         0
## 888   63  1            1        145        233         1
## 889   67  1            4        160        286         0
## 890   67  1            4        120        229         0
## 891   37  1            3        130        250         0
## 892   41  0            2        130        204         0
## 893   56  1            2        120        236         0
```

```
## 894   62   0                4           140          268                    0
## 895   57   0                4           120          354                    0
## 896   63   1                4           130          254                    0
## 897   53   1                4           140          203                    1
## 898   57   1                4           140          192                    0
## 899   56   0                2           140          294                    0
## 900   56   1                3           130          256                    1
## 901   44   1                2           120          263                    0
## 902   52   1                3           172          199                    1
## 903   57   1                3           150          168                    0
## 904   48   1                2           110          229                    0
## 905   54   1                4           140          239                    0
## 906   48   0                3           130          275                    0
## 907   49   1                2           130          266                    0
## 908   64   1                1           110          211                    0
## 909   58   0                1           150          283                    1
## 910   58   1                2           120          284                    0
## 911   58   1                3           132          224                    0
## 912   60   1                4           130          206                    0
## 913   50   0                3           120          219                    0
## 914   58   0                3           120          340                    0
## 915   66   0                1           150          226                    0
## 916   43   1                4           150          247                    0
## 917   40   1                4           110          167                    0
## 918   69   0                1           140          239                    0
## 919   60   1                4           117          230                    1
## 920   64   1                3           140          335                    0
## 921   59   1                4           135          234                    0
## 922   44   1                3           130          233                    0
## 923   42   1                4           140          226                    0
## 924   43   1                4           120          177                    0
## 925   57   1                4           150          276                    0
## 926   55   1                4           132          353                    0
## 927   61   1                3           150          243                    1
## 928   65   0                4           150          225                    0
## 929   40   1                1           140          199                    0
## 930   71   0                2           160          302                    0
## 931   59   1                3           150          212                    1
## 932   61   0                4           130          330                    0
## 933   58   1                3           112          230                    0
## 934   51   1                3           110          175                    0
## 935   50   1                4           150          243                    0
## 936   65   0                3           140          417                    1
## 937   53   1                3           130          197                    1
## 938   41   0                2           105          198                    0
## 939   65   1                4           120          177                    0
## 940   44   1                4           112          290                    0
## 941   44   1                2           130          219                    0
## 942   60   1                4           130          253                    0
## 943   54   1                4           124          266                    0
```

```
## 944   50   1                3           140           233                  0
## 945   41   1                4           110           172                  0
## 946   54   1                3           125           273                  0
## 947   51   1                1           125           213                  0
## 948   51   0                4           130           305                  0
## 949   46   0                3           142           177                  0
## 950   58   1                4           128           216                  0
## 951   54   0                3           135           304                  1
## 952   54   1                4           120           188                  0
## 953   60   1                4           145           282                  0
## 954   60   1                3           140           185                  0
## 955   54   1                3           150           232                  0
## 956   59   1                4           170           326                  0
## 957   46   1                3           150           231                  0
## 958   65   0                3           155           269                  0
## 959   67   1                4           125           254                  1
## 960   62   1                4           120           267                  0
## 961   65   1                4           110           248                  0
## 962   44   1                4           110           197                  0
## 963   65   0                3           160           360                  0
## 964   60   1                4           125           258                  0
## 965   51   0                3           140           308                  0
## 966   48   1                2           130           245                  0
## 967   58   1                4           150           270                  0
## 968   45   1                4           104           208                  0
## 969   53   0                4           130           264                  0
## 970   39   1                3           140           321                  0
## 971   68   1                3           180           274                  1
## 972   52   1                2           120           325                  0
## 973   44   1                3           140           235                  0
## 974   47   1                3           138           257                  0
## 975   53   0                3           128           216                  0
## 976   53   0                4           138           234                  0
## 977   51   0                3           130           256                  0
## 978   66   1                4           120           302                  0
## 979   62   0                4           160           164                  0
## 980   62   1                3           130           231                  0
## 981   44   0                3           108           141                  0
## 982   63   0                3           135           252                  0
## 983   52   1                4           128           255                  0
## 984   59   1                4           110           239                  0
## 985   60   0                4           150           258                  0
## 986   52   1                2           134           201                  0
## 987   48   1                4           122           222                  0
## 988   45   1                4           115           260                  0
## 989   34   1                1           118           182                  0
## 990   57   0                4           128           303                  0
## 991   71   0                3           110           265                  1
## 992   49   1                3           120           188                  0
## 993   54   1                2           108           309                  0
```

```
## 994   59   1               4          140          177                   0
## 995   57   1               3          128          229                   0
## 996   61   1               4          120          260                   0
## 997   39   1               4          118          219                   0
## 998   61   0               4          145          307                   0
## 999   56   1               4          125          249                   1
## 1000  52   1               1          118          186                   0
## 1001  43   0               4          132          341                   1
## 1002  62   0               3          130          263                   0
## 1003  41   1               2          135          203                   0
## 1004  58   1               3          140          211                   1
## 1005  35   0               4          138          183                   0
## 1006  63   1               4          130          330                   1
## 1007  65   1               4          135          254                   0
## 1008  48   1               4          130          256                   1
## 1009  63   0               4          150          407                   0
## 1010  51   1               3          100          222                   0
## 1011  55   1               4          140          217                   0
## 1012  65   1               1          138          282                   1
## 1013  45   0               2          130          234                   0
## 1014  56   0               4          200          288                   1
## 1015  54   1               4          110          239                   0
## 1016  44   1               2          120          220                   0
## 1017  62   0               4          124          209                   0
## 1018  54   1               3          120          258                   0
## 1019  51   1               3           94          227                   0
## 1020  29   1               2          130          204                   0
## 1021  51   1               4          140          261                   0
## 1022  43   0               3          122          213                   0
## 1023  55   0               2          135          250                   0
## 1024  70   1               4          145          174                   0
## 1025  62   1               2          120          281                   0
## 1026  35   1               4          120          198                   0
## 1027  51   1               3          125          245                   1
## 1028  59   1               2          140          221                   0
## 1029  59   1               1          170          288                   0
## 1030  52   1               2          128          205                   1
## 1031  64   1               3          125          309                   0
## 1032  58   1               3          105          240                   0
## 1033  47   1               3          108          243                   0
## 1034  57   1               4          165          289                   1
## 1035  41   1               3          112          250                   0
## 1036  45   1               2          128          308                   0
## 1037  60   0               3          102          318                   0
## 1038  52   1               1          152          298                   1
## 1039  42   0               4          102          265                   0
## 1040  67   0               3          115          564                   0
## 1041  55   1               4          160          289                   0
## 1042  64   1               4          120          246                   0
## 1043  70   1               4          130          322                   0
```

```
## 1044  51   1                4           140          299                 0
## 1045  58   1                4           125          300                 0
## 1046  60   1                4           140          293                 0
## 1047  68   1                3           118          277                 0
## 1048  46   1                2           101          197                 1
## 1049  77   1                4           125          304                 0
## 1050  54   0                3           110          214                 0
## 1051  58   0                4           100          248                 0
## 1052  48   1                3           124          255                 1
## 1053  57   1                4           132          207                 0
## 1054  52   1                3           138          223                 0
## 1055  54   0                2           132          288                 1
## 1056  35   1                4           126          282                 0
## 1057  45   0                2           112          160                 0
## 1058  70   1                3           160          269                 0
## 1059  53   1                4           142          226                 0
## 1060  59   0                4           174          249                 0
## 1061  62   0                4           140          394                 0
## 1062  64   1                4           145          212                 0
## 1063  57   1                4           152          274                 0
## 1064  52   1                4           108          233                 1
## 1065  56   1                4           132          184                 0
## 1066  43   1                3           130          315                 0
## 1067  53   1                3           130          246                 1
## 1068  48   1                4           124          274                 0
## 1069  56   0                4           134          409                 0
## 1070  42   1                1           148          244                 0
## 1071  59   1                1           178          270                 0
## 1072  60   0                4           158          305                 0
## 1073  63   0                2           140          195                 0
## 1074  42   1                3           120          240                 1
## 1075  66   1                2           160          246                 0
## 1076  54   1                2           192          283                 0
## 1077  69   1                3           140          254                 0
## 1078  50   1                3           129          196                 0
## 1079  51   1                4           140          298                 0
## 1080  43   1                4           132          247                 1
## 1081  62   0                4           138          294                 1
## 1082  68   0                3           120          211                 0
## 1083  67   1                4           100          299                 0
## 1084  69   1                1           160          234                 1
## 1085  45   0                4           138          236                 0
## 1086  50   0                2           120          244                 0
## 1087  59   1                1           160          273                 0
## 1088  50   0                4           110          254                 0
## 1089  64   0                4           180          325                 0
## 1090  57   1                3           150          126                 1
## 1091  64   0                3           140          313                 0
## 1092  43   1                4           110          211                 0
## 1093  45   1                4           142          309                 0
```

```
## 1094  58   1                4           128           259                     0
## 1095  50   1                4           144           200                     0
## 1096  55   1                2           130           262                     0
## 1097  62   0                4           150           244                     0
## 1098  37   0                3           120           215                     0
## 1099  38   1                1           120           231                     0
## 1100  41   1                3           130           214                     0
## 1101  66   0                4           178           228                     1
## 1102  52   1                4           112           230                     0
## 1103  56   1                1           120           193                     0
## 1104  46   0                2           105           204                     0
## 1105  46   0                4           138           243                     0
## 1106  64   0                4           130           303                     0
## 1107  59   1                4           138           271                     0
## 1108  41   0                3           112           268                     0
## 1109  54   0                3           108           267                     0
## 1110  39   0                3            94           199                     0
## 1111  53   1                4           123           282                     0
## 1112  63   0                4           108           269                     0
## 1113  34   0                2           118           210                     0
## 1114  47   1                4           112           204                     0
## 1115  67   0                3           152           277                     0
## 1116  54   1                4           110           206                     0
## 1117  66   1                4           112           212                     0
## 1118  52   0                3           136           196                     0
## 1119  55   0                4           180           327                     0
## 1120  49   1                3           118           149                     0
## 1121  74   0                2           120           269                     0
## 1122  54   0                3           160           201                     0
## 1123  54   1                4           122           286                     0
## 1124  56   1                4           130           283                     1
## 1125  46   1                4           120           249                     0
## 1126  49   0                2           134           271                     0
## 1127  42   1                2           120           295                     0
## 1128  41   1                2           110           235                     0
## 1129  41   0                2           126           306                     0
## 1130  49   0                4           130           269                     0
## 1131  61   1                1           134           234                     0
## 1132  60   0                3           120           178                     1
## 1133  67   1                4           120           237                     0
## 1134  58   1                4           100           234                     0
## 1135  47   1                4           110           275                     0
## 1136  52   1                4           125           212                     0
## 1137  62   1                2           128           208                     1
## 1138  57   1                4           110           201                     0
## 1139  58   1                4           146           218                     0
## 1140  64   1                4           128           263                     0
## 1141  51   0                3           120           295                     0
## 1142  43   1                4           115           303                     0
## 1143  42   0                3           120           209                     0
```

```
## 1144  67   0               4          106          223                   0
## 1145  76   0               3          140          197                   0
## 1146  70   1               2          156          245                   0
## 1147  57   1               2          124          261                   0
## 1148  44   0               3          118          242                   0
## 1149  58   0               2          136          319                   1
## 1150  60   0               1          150          240                   0
## 1151  44   1               3          120          226                   0
## 1152  61   1               4          138          166                   0
## 1153  42   1               4          136          315                   0
## 1154  52   1               4          128          204                   1
## 1155  59   1               3          126          218                   1
## 1156  40   1               4          152          223                   0
## 1157  42   1               3          130          180                   0
## 1158  61   1               4          140          207                   0
## 1159  66   1               4          160          228                   0
## 1160  46   1               4          140          311                   0
## 1161  71   0               4          112          149                   0
## 1162  59   1               1          134          204                   0
## 1163  64   1               1          170          227                   0
## 1164  66   0               3          146          278                   0
## 1165  39   0               3          138          220                   0
## 1166  57   1               2          154          232                   0
## 1167  58   0               4          130          197                   0
## 1168  57   1               4          110          335                   0
## 1169  47   1               3          130          253                   0
## 1170  55   0               4          128          205                   0
## 1171  35   1               2          122          192                   0
## 1172  61   1               4          148          203                   0
## 1173  58   1               4          114          318                   0
## 1174  58   0               4          170          225                   1
## 1175  58   1               2          125          220                   0
## 1176  56   1               2          130          221                   0
## 1177  56   1               2          120          240                   0
## 1178  67   1               3          152          212                   0
## 1179  55   0               2          132          342                   0
## 1180  44   1               4          120          169                   0
## 1181  63   1               4          140          187                   0
## 1182  63   0               4          124          197                   0
## 1183  41   1               2          120          157                   0
## 1184  59   1               4          164          176                   1
## 1185  57   0               4          140          241                   0
## 1186  45   1               1          110          264                   0
## 1187  68   1               4          144          193                   1
## 1188  57   1               4          130          131                   0
## 1189  57   0               2          130          236                   0
## 1190  38   1               3          138          175                   0
##      resting.ecg max.heart.rate exercise.angina oldpeak ST.slope target
## 1              0            172               0     0.0        1      0
## 2              0            156               0     1.0        2      1
```

```
## 3                  1             98               0     0.0        1      0
## 4                  0            108               1     1.5        2      1
## 5                  0            122               0     0.0        1      0
## 6                  0            170               0     0.0        1      0
## 7                  0            170               0     0.0        1      0
## 8                  0            142               0     0.0        1      0
## 9                  0            130               1     1.5        2      1
## 10                 0            120               0     0.0        1      0
## 11                 0            142               0     0.0        1      0
## 12                 1             99               1     2.0        2      1
## 13                 0            145               0     0.0        1      0
## 14                 0            140               1     1.0        2      1
## 15                 1            137               0     0.0        1      0
## 16                 0            150               0     1.5        2      0
## 17                 0            166               0     0.0        2      1
## 18                 0            165               0     0.0        1      0
## 19                 0            125               0     1.0        2      1
## 20                 0            160               0     3.0        2      1
## 21                 0            142               0     0.0        1      0
## 22                 0            142               0     1.0        2      0
## 23                 0            164               0     0.0        1      0
## 24                 0            150               1     3.0        2      1
## 25                 0            138               0     0.0        1      0
## 26                 0            178               0     0.0        1      0
## 27                 1            112               1     3.0        2      0
## 28                 0            118               0     0.0        1      0
## 29                 0            127               0     0.0        1      0
## 30                 0            145               0     0.0        1      0
## 31                 0            130               0     0.0        2      1
## 32                 0            114               0     0.0        1      0
## 33                 0            122               0     2.0        2      1
## 34                 1            130               0     2.0        2      1
## 35                 0            154               0     0.0        1      0
## 36                 0            155               0     0.0        1      0
## 37                 0             87               1     1.5        2      1
## 38                 1            142               0     0.0        1      0
## 39                 1            148               0     0.0        1      0
## 40                 0            130               1     1.0        2      0
## 41                 0            130               0     0.0        1      0
## 42                 1            100               1     0.0        2      1
## 43                 0            168               0     0.0        1      0
## 44                 1            170               0     0.0        1      0
## 45                 0            120               1     1.0        2      1
## 46                 0            120               1     1.0        2      0
## 47                 0            168               0     0.0        1      0
## 48                 0            170               0     0.0        1      0
## 49                 0            184               0     1.0        2      0
## 50                 0            170               0     0.0        2      1
## 51                 0            121               1     2.0        2      1
## 52                 0             98               1     2.0        2      1
```

```
## 53               0            122               0      0.0          1       0
## 54               0            150               0      0.0          1       0
## 55               0            140               1      1.5          2       0
## 56               0            170               0      0.0          1       0
## 57               0            153               1      1.5          2       1
## 58               1            140               0      0.0          2       1
## 59               1            134               0      1.0          1       0
## 60               1             96               1      1.0          2       1
## 61               0            174               0      0.0          1       0
## 62               0            175               0      0.0          1       0
## 63               0            144               0      0.0          1       0
## 64               0            125               1      1.0          2       1
## 65               0            145               0      0.0          1       0
## 66               0            130               0      0.0          1       0
## 67               0            144               0      0.0          1       0
## 68               0            184               0      0.0          1       0
## 69               1             82               1      4.0          2       1
## 70               0            170               0      0.0          1       0
## 71               1            145               1      1.0          2       1
## 72               0            135               0      0.0          1       0
## 73               0            150               0      0.0          2       1
## 74               1            115               0      0.0          1       0
## 75               0            128               1      1.5          2       1
## 76               0            116               0      0.0          1       0
## 77               0            130               0      0.0          2       1
## 78               0            150               0      0.0          1       0
## 79               0            138               1      0.0          1       0
## 80               0            170               0      0.0          2       1
## 81               0            160               0      0.0          1       0
## 82               0            154               0      0.0          1       0
## 83               0            115               0      0.0          2       1
## 84               0            165               0      0.0          1       0
## 85               0            125               1      1.0          2       1
## 86               0             94               1      1.0          2       1
## 87               0            112               1      2.0          2       1
## 88               0            142               1      2.0          2       0
## 89               1            155               0      0.0          2       1
## 90               0            110               1      0.5          2       0
## 91               0            160               0      0.0          1       0
## 92               0            140               0      0.0          1       0
## 93               0            148               0      0.0          1       0
## 94               0             92               1      1.5          2       1
## 95               1            180               0      0.0          1       0
## 96               0            140               1      2.0          2       1
## 97               0            138               0      0.0          1       0
## 98               0            160               0      0.0          1       0
## 99               0            140               0      0.0          1       0
## 100              0            144               0      0.0          1       0
## 101              1            115               1      1.0          2       1
## 102              0            100               0      0.0          1       0
```

```
## 103                 0            130                  0      2.0           2       1
## 104                 0            152                  1      1.0           2       1
## 105                 0            124                  0      0.0           2       1
## 106                 0            140                  0      0.0           1       0
## 107                 1            110                  0      0.0           1       0
## 108                 1            168                  0      0.0           1       0
## 109                 0            135                  0      0.0           1       0
## 110                 0            106                  0      0.0           1       0
## 111                 0            124                  0      1.0           2       0
## 112                 0             92                  1      3.0           2       1
## 113                 0            125                  1      0.0           1       0
## 114                 0            150                  0      0.0           1       0
## 115                 1            135                  0      0.0           1       0
## 116                 0            150                  1      1.0           2       1
## 117                 0            170                  0      0.0           2       1
## 118                 1            130                  1      1.5           2       1
## 119                 1            185                  0      0.0           1       0
## 120                 0            180                  0      0.0           2       1
## 121                 0            170                  0      0.0           2       1
## 122                 0            139                  0      0.0           1       0
## 123                 1            140                  0      0.0           1       0
## 124                 0            110                  1      1.0           2       1
## 125                 0            150                  0      0.0           1       0
## 126                 0            110                  0      0.0           1       0
## 127                 0            190                  0      0.0           1       0
## 128                 0            175                  0      2.0           1       0
## 129                 0            140                  0      0.0           1       0
## 130                 0            152                  1      1.5           2       0
## 131                 0            130                  0      0.0           1       0
## 132                 0            150                  1      0.0           2       1
## 133                 1            122                  1      2.0           2       1
## 134                 1            124                  1      1.5           2       1
## 135                 1            120                  1      1.0           2       0
## 136                 0            175                  0      0.0           2       1
## 137                 1            175                  0      0.0           1       0
## 138                 1            146                  0      2.0           1       0
## 139                 0            118                  1      0.0           2       1
## 140                 0            130                  1      2.0           2       1
## 141                 0             94                  1      2.5           2       1
## 142                 1            125                  1      2.5           2       1
## 143                 1            158                  1      3.0           2       1
## 144                 0            155                  0      0.0           1       0
## 145                 0            150                  0      1.0           2       1
## 146                 0            132                  0      0.0           1       0
## 147                 0            155                  0      0.0           1       0
## 148                 1            176                  0      0.0           1       0
## 149                 0            160                  0      0.0           1       0
## 150                 0            125                  1      1.0           2       1
## 151                 0            120                  0      0.0           1       0
## 152                 0            100                  0      0.0           1       0
```

```
## 153                 0             150                 0      0.0           1       0
## 154                 0             140                 0      0.0           1       0
## 155                 1             160                 0      0.0           1       0
## 156                 0             150                 1      3.0           2       1
## 157                 0             150                 1      1.0           2       1
## 158                 0             130                 0      0.0           1       0
## 159                 0             100                 1      2.0           2       1
## 160                 1             130                 0      1.0           1       0
## 161                 2             119                 1      0.0           2       1
## 162                 0              96                 1      0.0           2       1
## 163                 0             174                 0      0.0           1       0
## 164                 0             160                 0      0.0           1       0
## 165                 0             150                 0      0.0           1       0
## 166                 0             140                 0      0.0           1       0
## 167                 0             175                 0      2.0           2       1
## 168                 1             140                 1      5.0           2       1
## 169                 0             118                 0      0.0           1       0
## 170                 0             100                 0      0.0           1       0
## 171                 0             160                 0      0.0           1       0
## 172                 0             160                 0      0.0           1       0
## 173                 0             188                 0      0.0           1       0
## 174                 0             162                 0      0.0           1       0
## 175                 0             172                 0      0.0           1       0
## 176                 0             134                 1      2.0           2       1
## 177                 0             135                 1      2.0           2       1
## 178                 0             105                 0      1.5           2       1
## 179                 0             150                 0      0.0           1       0
## 180                 0             150                 0      0.0           1       0
## 181                 0              90                 0      0.0           1       0
## 182                 0             120                 1      2.0           2       1
## 183                 0             150                 0      0.0           1       0
## 184                 0             124                 1      2.0           2       1
## 185                 1             140                 1      1.0           2       0
## 186                 0             130                 0      0.0           1       0
## 187                 1              92                 0      0.0           2       1
## 188                 0             110                 0      0.0           1       0
## 189                 0             138                 1      1.0           2       1
## 190                 0             110                 1      1.0           2       0
## 191                 1             120                 1      1.5           2       1
## 192                 1             120                 0      0.0           1       0
## 193                 1             116                 0      0.0           1       0
## 194                 0             160                 0      0.0           1       0
## 195                 0             110                 0      0.0           1       0
## 196                 0             180                 0      0.0           1       0
## 197                 0             116                 0      0.0           1       0
## 198                 0             132                 0      1.0           2       0
## 199                 0             136                 0      0.0           1       0
## 200                 0             116                 1      0.0           2       1
## 201                 0              98                 0      1.0           2       0
## 202                 0             150                 0      0.0           1       0
```

```
## 203                 0            150                0      0.0          1       0
## 204                 0            146                0      0.0          1       0
## 205                 1            150                0      0.0          1       0
## 206                 0            100                0      0.0          1       0
## 207                 0            140                1      0.0          1       0
## 208                 2            180                0      0.0          1       0
## 209                 0            140                0      0.0          2       1
## 210                 2            185                0      0.0          1       0
## 211                 0            140                0      0.0          2       1
## 212                 0            110                0      0.0          2       1
## 213                 0            140                1      0.0          2       1
## 214                 0            128                1      1.0          1       0
## 215                 1            164                0      0.0          1       0
## 216                 0             98                1      1.5          2       1
## 217                 1            170                0      0.0          1       0
## 218                 0            150                0      0.0          2       1
## 219                 0            137                0      0.0          1       0
## 220                 0            150                0      0.0          1       0
## 221                 0            170                0      0.0          1       0
## 222                 0            112                0      0.0          2       1
## 223                 0            150                1      1.0          2       1
## 224                 0            125                0      0.0          1       0
## 225                 0            185                0      0.0          1       0
## 226                 0            137                0      0.0          1       0
## 227                 0            150                0      0.0          2       1
## 228                 0            140                0      0.0          1       0
## 229                 0            134                1      2.5          2       1
## 230                 0            170                0      0.0          1       0
## 231                 1            184                0      0.0          1       0
## 232                 0            158                0      0.0          1       0
## 233                 0            167                0      0.0          1       0
## 234                 0            129                0      0.0          1       0
## 235                 0            142                0      0.0          1       0
## 236                 1            140                0      0.0          1       0
## 237                 0            160                1      1.0          2       0
## 238                 0            118                1      3.0          2       1
## 239                 0            136                0      0.0          2       1
## 240                 0             99                1      2.0          2       1
## 241                 0            102                1      3.0          2       1
## 242                 0            155                0      0.0          1       0
## 243                 0            142                1      2.0          2       1
## 244                 0            143                1      2.0          2       1
## 245                 0            118                0      0.0          1       0
## 246                 0            103                1      1.0          2       1
## 247                 0            137                0      2.0          1       0
## 248                 0            150                1      1.5          2       1
## 249                 1            150                1      2.0          3       1
## 250                 1            130                1      1.0          2       1
## 251                 0            120                1      1.0          2       1
## 252                 0            135                0      0.0          2       1
```

```
## 253                 0            115                  0      2.0          2       1
## 254                 1            115                  1      0.0          1       0
## 255                 0            152                  0      1.0          1       0
## 256                 0             96                  1      2.0          2       1
## 257                 0            130                  0      0.0          1       0
## 258                 2            150                  0      0.0          1       0
## 259                 0            172                  0      0.0          1       0
## 260                 0            120                  0      0.5          1       0
## 261                 0            155                  0      0.0          1       0
## 262                 0            165                  1      0.0          1       0
## 263                 0            138                  0      1.0          1       0
## 264                 0            115                  1      0.0          2       1
## 265                 0            125                  0      0.0          2       1
## 266                 0            145                  1      1.0          2       1
## 267                 0            175                  0      0.0          1       0
## 268                 0            110                  1      1.0          2       1
## 269                 0            150                  0      0.0          1       0
## 270                 0             91                  1      1.0          2       1
## 271                 0            145                  0      2.0          2       0
## 272                 0            140                  0      0.0          1       0
## 273                 0            165                  0      0.0          1       0
## 274                 0            130                  1      3.0          2       1
## 275                 2            134                  0      0.0          1       0
## 276                 0            180                  0      0.0          1       0
## 277                 0            100                  0      0.0          1       0
## 278                 0            150                  0      2.0          2       1
## 279                 0            126                  1      1.5          2       1
## 280                 1            126                  1      0.8          2       0
## 281                 1            155                  0      0.0          1       0
## 282                 2            135                  0      0.0          1       0
## 283                 0            122                  0      2.0          2       1
## 284                 0            160                  1      2.0          1       0
## 285                 1            160                  0      0.0          1       0
## 286                 0            170                  0      0.0          1       0
## 287                 0            120                  0      0.0          1       0
## 288                 0            140                  0      0.0          1       0
## 289                 0            132                  0      0.0          1       0
## 290                 1            156                  0      2.0          1       0
## 291                 0            180                  0      0.0          1       0
## 292                 0            138                  0      0.0          1       0
## 293                 0            135                  0      1.0          1       0
## 294                 0            148                  0      0.0          1       0
## 418                 1            112                  1      3.0          2       1
## 419                 1            127                  0      0.0          1       0
## 420                 1            140                  1      1.5          3       1
## 421                 1            149                  1      2.5          1       1
## 422                 2             99                  1      1.3          2       0
## 424                 1            105                  1      0.0          2       1
## 427                 1            157                  0      0.5          2       1
## 428                 1            140                  0      0.0          1       0
```

```
## 433                  1                86                 0      0.0         1       0
## 434                  0                84                 1      2.5         3       1
## 435                  0               125                 1      2.0         2       1
## 445                  1               140                 1      0.5         2       1
## 446                  0               120                 1      1.5         2       1
## 447                  1               124                 1      1.6         2       1
## 449                  1               110                 1      2.0         1       1
## 450                  0               105                 1      1.0         2       1
## 454                  1               118                 1      1.5         2       1
## 456                  0               123                 1      1.2         2       1
## 462                  1               118                 1      1.9         2       1
## 464                  0               117                 1      1.3         3       1
## 467                  0               160                 0      0.0         1       0
## 470                  1                97                 1      1.6         1       1
## 471                  0               161                 0      2.0         2       0
## 475                  1               122                 1      1.7         2       1
## 478                  2               139                 0      0.1         1       0
## 480                  1               148                 1      2.0         2       1
## 484                  0               125                 0      2.5         1       1
## 487                  1               128                 1      1.2         2       1
## 488                  1               180                 0      0.4         1       0
## 489                  1               144                 1      2.0         2       1
## 490                  0               135                 0      0.3         1       0
## 491                  0               140                 1      3.0         2       1
## 492                  0               102                 1      1.0         2       1
## 493                  1               108                 0      0.0         2       1
## 495                  0               127                 1      1.7         2       1
## 496                  0               110                 1      2.5         2       1
## 497                  0               140                 1      1.0         2       1
## 498                  0                69                 0      1.0         3       0
## 499                  0               148                 1      3.0         3       1
## 500                  1               130                 1      0.0         2       1
## 501                  0               130                 1      1.0         2       1
## 502                  0               140                 1      4.0         3       1
## 503                  0               138                 1      2.0         2       1
## 504                  1               140                 1      2.0         2       1
## 505                  1               138                 0      0.2         1       0
## 506                  0               112                 1      3.0         3       1
## 507                  1               131                 1      1.2         2       1
## 508                  0               112                 1      3.0         2       1
## 509                  0                80                 1      0.0         1       0
## 511                  0               110                 0      0.0         2       1
## 512                  0               126                 0      0.3         1       0
## 513                  1                88                 1      2.0         2       1
## 514                  1               153                 0     -0.1         1       0
## 515                  1               150                 1      1.3         2       1
## 518                  0               132                 0      0.0         0       1
## 519                  0               120                 1      1.5         2       1
## 521                  1               121                 1      1.0         1       1
## 522                  1               128                 0      0.5         2       0
```

```
## 523            1        135          1    4.0       3     1
## 524            2        120          1    1.0       1     1
## 525            0        117          1    1.0       2     1
## 526            1        150          0    0.0       1     0
## 527            0        144          0    0.1       1     0
## 528            2        113          1    1.7       2     1
## 529            0        135          0    0.3       1     0
## 530            0        127          1    1.5       2     1
## 531            0        109          1    1.4       2     1
## 532            0        128          1    1.1       2     1
## 533            1        115          1    1.8       2     1
## 534            1        102          0    0.0       2     1
## 535            1        140          1    2.0       2     1
## 536            0        135          1    2.5       3     1
## 539            1        130          1    4.0       3     1
## 540            0        112          1    2.0       2     1
## 541            2        100          0    0.0       1     0
## 542            1        122          1    1.2       2     1
## 543            2        120          0    3.5       3     1
## 544            0        105          1    1.5       2     1
## 545            1        129          1    3.0       3     1
## 546            0        120          1    0.0       1     0
## 547            1        139          0    0.2       1     0
## 548            1        162          0    0.0       2     1
## 549            1        100          0    1.5       3     1
## 550            0        140          0    1.5       1     1
## 551            1        135          0    0.2       1     0
## 552            0         73          0    2.0       2     1
## 553            2         86          0    0.0       1     0
## 554            0        108          1    1.8       2     1
## 555            0        116          1    1.8       2     1
## 556            1        160          0    0.3       1     0
## 557            1        118          1    0.0       2     1
## 558            0        112          1    2.0       3     0
## 559            1        122          1    1.8       2     1
## 560            1        124          1    1.4       2     1
## 561            0        102          1    4.0       3     1
## 562            1        137          0    0.2       1     0
## 563            1        141          0    0.1       1     0
## 564            0        154          1    2.0       2     0
## 565            1        126          1    1.1       2     1
## 566            1        160          1    2.0       2     1
## 567            1        115          1    1.7       2     1
## 568            0        128          1    1.5       2     0
## 569            1        115          1    0.0       2     1
## 570            0        105          1    1.5       3     1
## 571            0        110          1    2.5       2     1
## 572            1        119          1    2.0       3     1
## 573            0        109          1    1.5       2     1
## 574            1        135          1    0.5       2     1
```

```
## 575                2            130              0     1.5        2      1
## 576                1            112              1     1.5        2      1
## 577                0            126              1     1.2        2      1
## 578                1            120              1     3.0        2      1
## 579                0            110              1     1.9        2      1
## 580                2            119              1     3.0        3      1
## 581                1            110              1     1.8        2      1
## 582                2            130              1     1.0        2      1
## 583                0            159              1     1.5        1      1
## 584                2             84              1     0.0        2      1
## 585                2            126              0     0.3        1      0
## 586                1            116              1     1.5        2      1
## 587                1            120              0     0.8        2      1
## 588                0            122              1     2.0        2      1
## 589                2            165              0     1.0        2      0
## 590                1            122              1     2.0        2      1
## 591                0             94              0     0.0        2      1
## 592                1            133              0     0.2        1      0
## 593                1            110              0     0.0        1      0
## 594                2            150              1     2.0        3      1
## 595                2            130              0     0.0        2      1
## 596                2            113              1     1.0        1      1
## 597                2            140              1     0.5        2      1
## 598                2            100              0     0.0        2      1
## 599                1            136              0     0.2        1      0
## 600                2            127              1     1.7        3      1
## 601                0             98              0     1.5        2      1
## 602                1             96              1     1.0        2      0
## 603                0            123              1     1.3        2      1
## 604                0             98              1     0.0        2      1
## 605                1            118              1     0.0        2      1
## 606                0            112              1     1.5        3      1
## 607                0            151              1     0.0        1      0
## 608                2             96              0     1.0        1      0
## 609                1            108              1     3.0        2      1
## 610                1            128              1     1.5        2      1
## 611                1            138              1     0.0        2      1
## 612                0            126              0     0.0        2      1
## 613                1            154              0     0.0        2      1
## 614                1            137              0     0.2        1      0
## 615                1            100              0     0.0        2      1
## 616                2            135              0     0.3        1      0
## 617                2             93              1     0.0        2      1
## 618                2            109              0     2.4        2      1
## 619                2            160              0     1.6        2      0
## 620                0            141              0     0.3        1      1
## 621                0            105              1     0.2        2      0
## 622                2            121              1     0.2        1      0
## 623                0            140              0     0.4        1      0
## 624                2            142              1     0.6        2      1
```

```
## 625                  2            142                 1      1.2          2       1
## 626                  2            170                 0      1.2          2       1
## 627                  2            154                 0      4.0          2       1
## 628                  0            161                 0      0.5          2       0
## 629                  2            111                 1      0.0          1       0
## 630                  2            180                 0      0.0          1       0
## 631                  0            145                 0      2.6          2       1
## 632                  2            159                 0      0.0          1       0
## 633                  0            125                 0      1.6          2       0
## 634                  0            120                 1      1.8          2       1
## 635                  2            155                 1      3.1          3       1
## 636                  2            144                 1      1.8          2       0
## 637                  0            178                 1      1.4          1       0
## 638                  2            129                 1      2.6          2       1
## 639                  2            180                 0      0.2          2       0
## 640                  0            181                 0      1.2          2       0
## 641                  0            143                 0      0.1          1       0
## 642                  2            159                 1      0.0          1       0
## 643                  0            139                 0      0.2          1       0
## 644                  2            152                 1      0.0          2       0
## 645                  2            157                 0      0.6          1       0
## 646                  2            165                 0      2.5          2       1
## 647                  2            130                 0      0.0          1       0
## 648                  2            150                 0      0.4          2       1
## 649                  2            138                 0      2.3          1       0
## 650                  0            170                 0      0.0          1       0
## 651                  2            140                 1      3.4          3       1
## 652                  2            126                 1      0.9          2       1
## 653                  2            150                 1      0.0          1       1
## 654                  2            138                 1      1.9          1       1
## 655                  2            125                 0      0.0          1       1
## 656                  0            150                 0      0.0          1       0
## 657                  2            186                 0      0.0          1       0
## 658                  0            181                 0      0.0          1       1
## 659                  0            163                 0      0.0          1       0
## 660                  0            179                 1      0.4          1       0
## 661                  0            156                 0      0.0          1       0
## 662                  0            134                 0      2.2          2       1
## 663                  2            165                 0      0.0          1       0
## 664                  2            126                 0      0.8          1       1
## 665                  2            177                 0      0.0          1       1
## 666                  0            120                 1      0.0          2       1
## 667                  2            114                 0      1.0          2       1
## 668                  0            125                 1      1.8          2       1
## 669                  0            184                 0      0.0          1       0
## 670                  2            157                 0      0.8          1       0
## 671                  0            179                 0      0.0          1       0
## 672                  2            175                 0      0.6          2       0
## 673                  0            168                 0      0.0          1       0
## 674                  2            125                 1      3.6          2       1
```

```
## 675               0          96             0     0.0       1      0
## 676               0         143             1     0.0       2      1
## 677               2         103             0     1.4       2      1
## 678               0         173             0     0.2       1      0
## 679               0         142             1     1.2       2      1
## 680               0         169             0     0.0       1      0
## 681               0         171             0     0.9       1      0
## 682               2         150             0     2.3       3      0
## 683               2         112             1     0.6       2      1
## 684               2         186             1     0.0       1      0
## 685               2         152             0     0.0       1      1
## 686               0         149             0     0.3       2      0
## 687               0         152             0     0.0       1      1
## 688               0         140             1     3.6       2      1
## 689               0         163             1     0.6       1      0
## 690               2         143             0     0.0       1      0
## 691               1         116             0     1.1       2      0
## 692               0         142             0     0.3       1      0
## 693               2         147             1     0.0       2      1
## 694               2         148             1     3.0       2      0
## 695               0         179             0     0.0       1      0
## 696               0         173             0     0.0       2      0
## 697               0         178             0     0.8       1      0
## 698               0         105             0     2.0       2      1
## 699               0         130             1     1.6       2      1
## 700               2         111             1     0.8       1      1
## 701               2         168             0     2.0       2      0
## 702               0         126             1     1.5       2      0
## 703               2         178             0     0.8       1      0
## 704               2         140             0     0.0       1      0
## 705               2         145             0     4.2       3      0
## 706               0         163             0     0.0       1      0
## 707               2         128             0     2.6       2      1
## 708               0         164             1     0.0       1      0
## 709               2         169             0     0.0       1      1
## 710               2         109             1     2.2       2      1
## 711               2         108             1     0.0       2      1
## 712               0         168             0     1.0       1      1
## 713               2         118             1     1.0       2      1
## 714               2         151             0     0.4       2      0
## 715               0         156             0     0.1       1      1
## 716               0         133             0     0.2       1      0
## 717               0         162             0     1.1       1      0
## 718               0         175             0     0.6       2      0
## 719               0          71             0     1.0       2      1
## 720               0         163             0     0.0       1      0
## 721               2         124             0     1.0       2      1
## 722               2         147             0     1.4       2      1
## 723               2         166             0     0.5       2      1
## 724               0         143             1     1.2       2      0
```

```
## 725                  2            157                0      2.6          2       1
## 726                  0            162                1      0.0          1       1
## 727                  0            138                0      0.0          2       0
## 728                  1            117                1      3.4          2       1
## 729                  0            153                0      0.0          1       0
## 730                  2            161                0      0.0          1       1
## 731                  0            170                0      0.0          1       0
## 732                  0            162                0      0.0          1       0
## 733                  0            162                0      0.0          2       0
## 734                  2            144                0      0.8          1       1
## 735                  2            133                1      4.0          3       1
## 736                  0            114                0      2.6          3       0
## 737                  2            103                1      1.6          3       1
## 738                  0            139                0      2.0          2       1
## 739                  2            116                1      3.2          2       1
## 740                  0             88                1      1.2          2       1
## 741                  2            151                0      0.8          1       0
## 742                  2            152                0      0.5          3       0
## 743                  0            163                0      0.0          1       0
## 744                  0             99                1      1.8          2       1
## 745                  2            169                0      0.1          2       0
## 746                  0            158                0      0.8          1       0
## 747                  0            160                1      1.4          1       1
## 748                  0            169                1      1.8          2       1
## 749                  2            132                1      0.1          1       1
## 750                  0            178                0      0.0          1       0
## 751                  2             96                1      2.2          3       1
## 752                  2            165                0      1.6          1       0
## 753                  2            160                1      1.4          3       0
## 754                  0            172                0      0.0          1       0
## 755                  2            144                1      1.2          2       1
## 756                  0            192                0      0.7          1       0
## 757                  0            168                1      0.0          1       0
## 758                  2            132                0      2.0          2       1
## 759                  2            182                0      0.0          1       0
## 760                  0            163                0      0.6          2       1
## 761                  2            125                1      1.4          1       0
## 762                  2            195                0      0.0          1       1
## 763                  0             95                1      2.0          2       1
## 764                  0            160                0      0.0          1       1
## 765                  2            114                1      2.0          2       1
## 766                  2            173                0      3.2          1       1
## 767                  2            172                1      0.0          1       0
## 768                  0            179                0      0.0          1       0
## 769                  0            158                0      1.6          2       0
## 770                  2            167                0      0.0          1       0
## 771                  0            122                0      2.0          2       0
## 772                  2            149                0      0.5          1       0
## 773                  0            172                0      0.0          1       0
## 774                  0            111                1      5.6          3       1
```

```
## 775              2           170            0      0.0        1       0
## 776              2           162            0      1.9        2       0
## 777              0           165            1      1.0        2       1
## 778              0           182            1      3.8        2       1
## 779              0           154            1      1.4        2       1
## 780              0           155            0      0.0        1       0
## 781              2           130            1      3.0        2       1
## 782              0           161            0      0.0        1       0
## 783              0           154            1      0.0        1       0
## 784              2           159            0      0.0        1       0
## 785              2           152            0      1.2        3       0
## 786              2           152            1      0.2        2       0
## 787              2           174            0      1.4        2       1
## 788              2           131            0      0.1        2       0
## 789              2           146            0      2.0        2       1
## 790              2           125            1      0.9        2       1
## 791              2           115            0      1.5        2       0
## 792              2           174            0      0.0        1       0
## 793              0           106            0      1.9        2       1
## 794              0           122            1      4.2        2       1
## 795              0           147            0      3.6        2       1
## 796              0           163            0      0.2        2       1
## 797              0           163            0      0.0        1       0
## 798              0           194            0      0.8        3       0
## 799              2           150            1      1.9        2       1
## 800              2           158            0      0.0        1       1
## 801              2           122            0      0.6        2       0
## 802              2           173            0      0.0        1       0
## 803              0           162            0      1.9        1       0
## 804              2           105            1      2.1        2       1
## 805              0           147            0      0.1        1       0
## 806              2           157            0      1.2        2       0
## 807              0           112            1      2.9        2       1
## 808              0           160            0      1.2        1       0
## 809              0           125            1      2.6        3       1
## 810              0           156            0      0.0        1       0
## 811              2           156            1      0.0        1       1
## 812              0           175            0      0.0        1       0
## 813              2           161            0      1.4        2       0
## 814              2           122            0      1.0        2       0
## 815              0           158            0      1.6        2       0
## 816              0           151            0      1.8        1       0
## 817              2           162            1      0.0        1       1
## 818              0           151            0      1.0        1       0
## 819              2           171            0      0.0        1       1
## 820              2           141            1      2.8        2       1
## 821              0           173            1      1.6        1       1
## 822              2           145            1      0.8        2       1
## 823              0           178            0      1.2        2       0
## 824              0           160            0      0.0        1       0
```

```
## 825      2      154      1    0.6     2    0
## 826      0      131      1    1.8     2    1
## 827      0      187      0    3.5     3    0
## 828      2      159      0    0.2     2    1
## 829      2      166      0    2.4     2    0
## 830      0      165      0    0.2     2    0
## 831      2      131      1    2.2     2    1
## 832      2      202      0    0.0     1    0
## 833      2      172      0    1.4     1    0
## 834      2      172      0    0.0     1    0
## 835      0      154      1    0.0     1    0
## 836      2      147      0    0.4     2    0
## 837      0      170      0    0.0     1    0
## 838      0      126      1    2.8     2    1
## 839      2      127      0    2.8     2    1
## 840      0      174      0    1.6     1    0
## 841      2      132      1    1.8     1    1
## 842      0      182      0    1.4     1    0
## 843      0      132      0    0.0     2    0
## 844      0       97      0    1.2     2    1
## 845      2      136      1    3.0     2    1
## 846      2      162      0    1.0     1    0
## 847      2      190      0    0.0     2    0
## 848      2      146      1    1.0     2    1
## 849      0      140      0    1.2     2    1
## 850      2      185      0    0.0     1    0
## 851      0      161      1    0.0     1    1
## 852      0      146      0    1.8     2    0
## 853      2      145      0    6.2     3    1
## 854      2      160      0    0.0     1    0
## 855      2      120      1    2.5     2    1
## 856      2      156      0    0.0     1    0
## 857      0      172      0    0.2     1    0
## 858      2      150      1    1.6     2    1
## 859      2      182      0    0.0     1    0
## 860      2      143      0    0.4     2    0
## 861      2      160      0    3.6     3    1
## 862      2      142      0    1.5     1    0
## 863      0      144      1    1.4     1    1
## 864      2      158      0    0.6     1    1
## 865      0      148      0    0.8     1    0
## 866      2      155      0    3.0     2    1
## 867      2      142      1    2.8     2    1
## 868      0      113      0    1.4     2    1
## 869      2      188      0    0.0     1    0
## 870      2      153      0    0.0     1    1
## 871      0      123      0    0.6     1    0
## 872      0      157      0    1.6     1    0
## 873      0      162      0    0.4     1    0
## 874      0      137      1    1.0     2    0
```

```
## 875              0            132                 1      1.2          2      1
## 876              0            158                 0      0.0          1      1
## 877              0            171                 0      1.5          1      0
## 878              0            172                 0      0.0          1      0
## 879              2            132                 1      2.4          2      1
## 880              2            160                 0      1.8          2      1
## 881              0            171                 0      0.6          1      0
## 882              0            168                 0      1.0          3      1
## 883              0            162                 0      0.5          1      0
## 884              0            173                 0      0.0          1      0
## 885              2            153                 0      1.3          2      0
## 886              0            148                 0      0.4          2      0
## 887              2            108                 1      1.5          2      1
## 888              2            150                 0      2.3          3      0
## 889              2            108                 1      1.5          2      1
## 890              2            129                 1      2.6          2      1
## 891              0            187                 0      3.5          3      0
## 892              2            172                 0      1.4          1      0
## 893              0            178                 0      0.8          1      0
## 894              2            160                 0      3.6          3      1
## 895              0            163                 1      0.6          1      0
## 896              2            147                 0      1.4          2      1
## 897              2            155                 1      3.1          3      1
## 898              0            148                 0      0.4          2      0
## 899              2            153                 0      1.3          2      0
## 900              2            142                 1      0.6          2      1
## 901              0            173                 0      0.0          1      0
## 902              0            162                 0      0.5          1      0
## 903              0            174                 0      1.6          1      0
## 904              0            168                 0      1.0          3      1
## 905              0            160                 0      1.2          1      0
## 906              0            139                 0      0.2          1      0
## 907              0            171                 0      0.6          1      0
## 908              2            144                 1      1.8          2      0
## 909              2            162                 0      1.0          1      0
## 910              2            160                 0      1.8          2      1
## 911              2            173                 0      3.2          1      1
## 912              2            132                 1      2.4          2      1
## 913              0            158                 0      1.6          2      0
## 914              0            172                 0      0.0          1      0
## 915              0            114                 0      2.6          3      0
## 916              0            171                 0      1.5          1      0
## 917              2            114                 1      2.0          2      1
## 918              0            151                 0      1.8          1      0
## 919              0            160                 1      1.4          1      1
## 920              0            158                 0      0.0          1      1
## 921              0            161                 0      0.5          2      0
## 922              0            179                 1      0.4          1      0
## 923              0            178                 0      0.0          1      0
## 924              2            120                 1      2.5          2      1
```

```
## 925             2          112             1     0.6        2      1
## 926             0          132             1     1.2        2      1
## 927             0          137             1     1.0        2      0
## 928             2          114             0     1.0        2      1
## 929             0          178             1     1.4        1      0
## 930             0          162             0     0.4        1      0
## 931             0          157             0     1.6        1      0
## 932             2          169             0     0.0        1      1
## 933             2          165             0     2.5        2      1
## 934             0          123             0     0.6        1      0
## 935             2          128             0     2.6        2      1
## 936             2          157             0     0.8        1      0
## 937             2          152             0     1.2        3      0
## 938             0          168             0     0.0        1      0
## 939             0          140             0     0.4        1      0
## 940             2          153             0     0.0        1      1
## 941             2          188             0     0.0        1      0
## 942             0          144             1     1.4        1      1
## 943             2          109             1     2.2        2      1
## 944             0          163             0     0.6        2      1
## 945             2          158             0     0.0        1      1
## 946             2          152             0     0.5        3      0
## 947             2          125             1     1.4        1      0
## 948             0          142             1     1.2        2      1
## 949             2          160             1     1.4        3      0
## 950             2          131             1     2.2        2      1
## 951             0          170             0     0.0        1      0
## 952             0          113             0     1.4        2      1
## 953             2          142             1     2.8        2      1
## 954             2          155             0     3.0        2      1
## 955             2          165             0     1.6        1      0
## 956             2          140             1     3.4        3      1
## 957             0          147             0     3.6        2      1
## 958             0          148             0     0.8        1      0
## 959             0          163             0     0.2        2      1
## 960             0           99             1     1.8        2      1
## 961             2          158             0     0.6        1      1
## 962             2          177             0     0.0        1      1
## 963             2          151             0     0.8        1      0
## 964             2          141             1     2.8        2      1
## 965             2          142             0     1.5        1      0
## 966             2          180             0     0.2        2      0
## 967             2          111             1     0.8        1      1
## 968             2          148             1     3.0        2      0
## 969             2          143             0     0.4        2      0
## 970             2          182             0     0.0        1      0
## 971             2          150             1     1.6        2      1
## 972             0          172             0     0.2        1      0
## 973             2          180             0     0.0        1      0
## 974             2          156             0     0.0        1      0
```

```
## 975     2    115    0    0.0    1    0
## 976     2    160    0    0.0    1    0
## 977     2    149    0    0.5    1    0
## 978     2    151    0    0.4    2    0
## 979     2    145    0    6.2    3    1
## 980     0    146    0    1.8    2    0
## 981     0    175    0    0.6    2    0
## 982     2    172    0    0.0    1    0
## 983     0    161    1    0.0    1    1
## 984     2    142    1    1.2    2    1
## 985     2    157    0    2.6    2    1
## 986     0    158    0    0.8    1    0
## 987     2    186    0    0.0    1    0
## 988     2    185    0    0.0    1    0
## 989     2    174    0    0.0    1    0
## 990     2    159    0    0.0    1    0
## 991     2    130    0    0.0    1    0
## 992     0    139    0    2.0    2    1
## 993     0    156    0    0.0    1    0
## 994     0    162    1    0.0    1    1
## 995     2    150    0    0.4    2    1
## 996     0    140    1    3.6    2    1
## 997     0    140    0    1.2    2    1
## 998     2    146    1    1.0    2    1
## 999     2    144    1    1.2    2    1
## 1000    2    190    0    0.0    2    0
## 1001    2    136    1    3.0    2    1
## 1002    0     97    0    1.2    2    1
## 1003    0    132    0    0.0    2    0
## 1004    2    165    0    0.0    1    0
## 1005    0    182    0    1.4    1    0
## 1006    2    132    1    1.8    1    1
## 1007    2    127    0    2.8    2    1
## 1008    2    150    1    0.0    1    1
## 1009    2    154    0    4.0    2    1
## 1010    0    143    1    1.2    2    0
## 1011    0    111    1    5.6    3    1
## 1012    2    174    0    1.4    2    1
## 1013    2    175    0    0.6    2    0
## 1014    2    133    1    4.0    3    1
## 1015    0    126    1    2.8    2    1
## 1016    0    170    0    0.0    1    0
## 1017    0    163    0    0.0    1    0
## 1018    2    147    0    0.4    2    0
## 1019    0    154    1    0.0    1    0
## 1020    2    202    0    0.0    1    0
## 1021    2    186    1    0.0    1    0
## 1022    0    165    0    0.2    2    0
## 1023    2    161    0    1.4    2    0
## 1024    0    125    1    2.6    3    1
```

```
## 1025              2            103                0     1.4         2      1
## 1026              0            130                1     1.6         2      1
## 1027              2            166                0     2.4         2      0
## 1028              0            164                1     0.0         1      0
## 1029              2            159                0     0.2         2      1
## 1030              0            184                0     0.0         1      0
## 1031              0            131                1     1.8         2      1
## 1032              2            154                1     0.6         2      0
## 1033              0            152                0     0.0         1      1
## 1034              2            124                0     1.0         2      1
## 1035              0            179                0     0.0         1      0
## 1036              2            170                0     0.0         1      0
## 1037              0            160                0     0.0         1      0
## 1038              0            178                0     1.2         2      0
## 1039              2            122                0     0.6         2      0
## 1040              2            160                0     1.6         2      0
## 1041              2            145                1     0.8         2      1
## 1042              2             96                1     2.2         3      1
## 1043              2            109                0     2.4         2      1
## 1044              0            173                1     1.6         1      1
## 1045              2            171                0     0.0         1      1
## 1046              2            170                0     1.2         2      1
## 1047              0            151                0     1.0         1      0
## 1048              0            156                0     0.0         1      0
## 1049              2            162                1     0.0         1      1
## 1050              0            158                0     1.6         2      0
## 1051              2            122                0     1.0         2      0
## 1052              0            175                0     0.0         1      0
## 1053              0            168                1     0.0         1      0
## 1054              0            169                0     0.0         1      0
## 1055              2            159                1     0.0         1      0
## 1056              2            156                1     0.0         1      1
## 1057              0            138                0     0.0         2      0
## 1058              0            112                1     2.9         2      1
## 1059              2            111                1     0.0         1      0
## 1060              0            143                1     0.0         2      1
## 1061              2            157                0     1.2         2      0
## 1062              2            132                0     2.0         2      1
## 1063              0             88                1     1.2         2      1
## 1064              0            147                0     0.1         1      0
## 1065              2            105                1     2.1         2      1
## 1066              0            162                0     1.9         1      0
## 1067              2            173                0     0.0         1      0
## 1068              2            166                0     0.5         2      1
## 1069              2            150                1     1.9         2      1
## 1070              2            178                0     0.8         1      0
## 1071              2            145                0     4.2         3      0
## 1072              2            161                0     0.0         1      1
## 1073              0            179                0     0.0         1      0
## 1074              0            194                0     0.8         3      0
```

```
## 1075          0          120           1     0.0      2      1
## 1076          2          195           0     0.0      1      1
## 1077          2          146           0     2.0      2      1
## 1078          0          163           0     0.0      1      0
## 1079          0          122           1     4.2      2      1
## 1080          2          143           1     0.1      2      1
## 1081          0          106           0     1.9      2      1
## 1082          2          115           0     1.5      2      0
## 1083          2          125           1     0.9      2      1
## 1084          2          131           0     0.1      2      0
## 1085          2          152           1     0.2      2      0
## 1086          0          162           0     1.1      1      0
## 1087          2          125           0     0.0      1      1
## 1088          2          159           0     0.0      1      0
## 1089          0          154           1     0.0      1      0
## 1090          0          173           0     0.2      1      0
## 1091          0          133           0     0.2      1      0
## 1092          0          161           0     0.0      1      0
## 1093          2          147           1     0.0      2      1
## 1094          2          130           1     3.0      2      1
## 1095          2          126           1     0.9      2      1
## 1096          0          155           0     0.0      1      0
## 1097          0          154           1     1.4      2      1
## 1098          0          170           0     0.0      1      0
## 1099          0          182           1     3.8      2      1
## 1100          2          168           0     2.0      2      0
## 1101          0          165           1     1.0      2      1
## 1102          0          160           0     0.0      1      1
## 1103          2          162           0     1.9      2      0
## 1104          0          172           0     0.0      1      0
## 1105          2          152           1     0.0      2      0
## 1106          0          122           0     2.0      2      0
## 1107          2          182           0     0.0      1      0
## 1108          2          172           1     0.0      1      0
## 1109          2          167           0     0.0      1      0
## 1110          0          179           0     0.0      1      0
## 1111          0           95           1     2.0      2      1
## 1112          0          169           1     1.8      2      1
## 1113          0          192           0     0.7      1      0
## 1114          0          143           0     0.1      1      0
## 1115          0          172           0     0.0      1      0
## 1116          2          108           1     0.0      2      1
## 1117          2          132           1     0.1      1      1
## 1118          2          169           0     0.1      2      0
## 1119          1          117           1     3.4      2      1
## 1120          2          126           0     0.8      1      1
## 1121          2          121           1     0.2      1      0
## 1122          0          163           0     0.0      1      0
## 1123          2          116           1     3.2      2      1
## 1124          2          103           1     1.6      3      1
```

```
## 1125                2            144               0      0.8         1       1
## 1126                0            162               0      0.0         2       0
## 1127                0            162               0      0.0         1       0
## 1128                0            153               0      0.0         1       0
## 1129                0            163               0      0.0         1       0
## 1130                0            163               0      0.0         1       0
## 1131                0            145               0      2.6         2       1
## 1132                0             96               0      0.0         1       0
## 1133                0             71               0      1.0         2       1
## 1134                0            156               0      0.1         1       1
## 1135                2            118               1      1.0         2       1
## 1136                0            168               0      1.0         1       1
## 1137                2            140               0      0.0         1       0
## 1138                0            126               1      1.5         2       0
## 1139                0            105               0      2.0         2       1
## 1140                0            105               1      0.2         2       0
## 1141                2            157               0      0.6         1       0
## 1142                0            181               0      1.2         2       0
## 1143                0            173               0      0.0         2       0
## 1144                0            142               0      0.3         1       0
## 1145                1            116               0      1.1         2       0
## 1146                2            143               0      0.0         1       0
## 1147                0            141               0      0.3         1       1
## 1148                0            149               0      0.3         2       0
## 1149                2            152               0      0.0         1       1
## 1150                0            171               0      0.9         1       0
## 1151                0            169               0      0.0         1       0
## 1152                2            125               1      3.6         2       1
## 1153                0            125               1      1.8         2       1
## 1154                0            156               1      1.0         2       1
## 1155                0            134               0      2.2         2       1
## 1156                0            181               0      0.0         1       1
## 1157                0            150               0      0.0         1       0
## 1158                2            138               1      1.9         1       1
## 1159                2            138               0      2.3         1       0
## 1160                0            120               1      1.8         2       1
## 1161                0            125               0      1.6         2       0
## 1162                0            162               0      0.8         1       1
## 1163                2            155               0      0.6         2       0
## 1164                2            152               0      0.0         2       0
## 1165                0            152               0      0.0         2       0
## 1166                2            164               0      0.0         1       1
## 1167                0            131               0      0.6         2       0
## 1168                0            143               1      3.0         2       1
## 1169                0            179               0      0.0         1       0
## 1170                1            130               1      2.0         2       1
## 1171                0            174               0      0.0         1       0
## 1172                0            161               0      0.0         1       1
## 1173                1            140               0      4.4         3       1
## 1174                2            146               1      2.8         2       1
```

```
## 1175              0              144                0     0.4         2      0
## 1176              2              163                0     0.0         1      0
## 1177              0              169                0     0.0         3      0
## 1178              2              150                0     0.8         2      1
## 1179              0              166                0     1.2         1      0
## 1180              0              144                1     2.8         3      1
## 1181              2              144                1     4.0         1      1
## 1182              0              136                1     0.0         2      1
## 1183              0              182                0     0.0         1      0
## 1184              2               90                0     1.0         2      1
## 1185              0              123                1     0.2         2      1
## 1186              0              132                0     1.2         2      1
## 1187              0              141                0     3.4         2      1
## 1188              0              115                1     1.2         2      1
## 1189              2              174                0     0.0         2      1
## 1190              0              173                0     0.0         1      0
```

```
heart_clean[heart_clean$resting.bp.s >= min(heart_rbps_boxplot$out), ]
```

```
##        age sex chest.pain.type resting.bp.s cholesterol fasting.blood.sugar
## 1       40   1               2          140         289                   0
## 2       49   0               3          160         180                   0
## 3       37   1               2          130         283                   0
## 4       48   0               4          138         214                   0
## 5       54   1               3          150         195                   0
## 6       39   1               3          120         339                   0
## 7       45   0               2          130         237                   0
## 8       54   1               2          110         208                   0
## 9       37   1               4          140         207                   0
## 10      48   0               2          120         284                   0
## 11      37   0               3          130         211                   0
## 12      58   1               2          136         164                   0
## 13      39   1               2          120         204                   0
## 14      49   1               4          140         234                   0
## 15      42   0               3          115         211                   0
## 16      54   0               2          120         273                   0
## 17      38   1               4          110         196                   0
## 18      43   0               2          120         201                   0
## 19      60   1               4          100         248                   0
## 20      36   1               2          120         267                   0
## 21      43   0               1          100         223                   0
## 22      44   1               2          120         184                   0
## 23      49   0               2          124         201                   0
## 24      44   1               2          150         288                   0
## 25      40   1               3          130         215                   0
## 26      36   1               3          130         209                   0
## 27      53   1               4          124         260                   0
## 28      52   1               2          120         284                   0
## 29      53   0               2          113         468                   0
## 30      51   1               2          125         188                   0
```

```
## 31    53   1               3          145         518                   0
## 32    56   1               3          130         167                   0
## 33    54   1               4          125         224                   0
## 34    41   1               4          130         172                   0
## 35    43   0               2          150         186                   0
## 36    32   1               2          125         254                   0
## 37    65   1               4          140         306                   1
## 38    41   0               2          110         250                   0
## 39    48   0               2          120         177                   1
## 40    48   0               4          150         227                   0
## 41    54   0               2          150         230                   0
## 42    54   0               3          130         294                   0
## 43    35   1               2          150         264                   0
## 44    52   1               3          140         259                   0
## 45    43   1               4          120         175                   0
## 46    59   1               3          130         318                   0
## 47    37   1               4          120         223                   0
## 48    50   1               2          140         216                   0
## 49    36   1               3          112         340                   0
## 50    41   1               4          110         289                   0
## 51    50   1               4          130         233                   0
## 52    47   0               4          120         205                   0
## 53    45   1               2          140         224                   1
## 54    41   0               2          130         245                   0
## 55    52   0               4          130         180                   0
## 56    51   0               2          160         194                   0
## 57    31   1               4          120         270                   0
## 58    58   1               3          130         213                   0
## 59    54   1               4          150         365                   0
## 60    52   1               4          112         342                   0
## 61    49   1               2          100         253                   0
## 62    43   0               3          150         254                   0
## 63    45   1               4          140         224                   0
## 64    46   1               4          120         277                   0
## 65    50   0               2          110         202                   0
## 66    37   0               2          120         260                   0
## 67    45   0               4          132         297                   0
## 68    32   1               2          110         225                   0
## 69    52   1               4          160         246                   0
## 70    44   1               4          150         412                   0
## 71    57   1               2          140         265                   0
## 72    44   1               2          130         215                   0
## 73    52   1               4          120         182                   0
## 74    44   0               4          120         218                   0
## 75    55   1               4          140         268                   0
## 76    46   1               3          150         163                   0
## 77    32   1               4          118         529                   0
## 78    35   0               4          140         167                   0
## 79    52   1               2          140         100                   0
## 80    49   1               4          130         206                   0
```

```
## 81     55   1                3          110          277                     0
## 82     54   1                2          120          238                     0
## 83     63   1                4          150          223                     0
## 84     52   1                2          160          196                     0
## 85     56   1                4          150          213                     1
## 86     66   1                4          140          139                     0
## 87     65   1                4          170          263                     1
## 88     53   0                2          140          216                     0
## 89     43   1                1          120          291                     0
## 90     55   1                4          140          229                     0
## 91     49   0                2          110          208                     0
## 92     39   1                4          130          307                     0
## 93     52   0                2          120          210                     0
## 94     48   1                4          160          329                     0
## 95     39   0                3          110          182                     0
## 96     58   1                4          130          263                     0
## 97     43   1                2          142          207                     0
## 98     39   1                3          160          147                     1
## 99     56   1                4          120           85                     0
## 100    41   1                2          125          269                     0
## 101    65   1                4          130          275                     0
## 102    51   1                4          130          179                     0
## 103    40   0                4          150          392                     0
## 104    40   1                4          120          466                     1
## 105    46   1                4          118          186                     0
## 106    57   1                2          140          260                     1
## 107    48   0                4          120          254                     0
## 108    34   1                2          150          214                     0
## 109    50   1                4          140          129                     0
## 110    39   1                2          190          241                     0
## 111    59   0                2          130          188                     0
## 112    57   1                4          150          255                     0
## 113    47   1                4          140          276                     1
## 114    38   1                2          140          297                     0
## 115    49   0                3          130          207                     0
## 116    33   0                4          100          246                     0
## 117    38   1                4          120          282                     0
## 118    59   0                4          130          338                     1
## 119    35   0                1          120          160                     0
## 120    34   1                1          140          156                     0
## 121    47   0                3          135          248                     1
## 122    52   0                3          125          272                     0
## 123    46   1                4          110          240                     0
## 124    58   0                2          180          393                     0
## 125    58   1                2          130          230                     0
## 126    54   1                2          120          246                     0
## 127    34   0                2          130          161                     0
## 128    48   0                4          108          163                     0
## 129    54   0                2          120          230                     1
## 130    42   1                3          120          228                     0
```

```
## 131   38   1               3           145          292                      0
## 132   46   1               4           110          202                      0
## 133   56   1               4           170          388                      0
## 134   56   1               4           150          230                      0
## 135   61   0               4           130          294                      0
## 136   49   1               3           115          265                      0
## 137   43   0               2           120          215                      0
## 138   39   1               2           120          241                      0
## 139   54   1               4           140          166                      0
## 140   43   1               4           150          247                      0
## 141   52   1               4           160          331                      0
## 142   50   1               4           140          341                      0
## 143   47   1               4           160          291                      0
## 144   53   1               4           140          243                      0
## 145   56   0               2           120          279                      0
## 146   39   1               4           110          273                      0
## 147   42   1               2           120          198                      0
## 148   43   0               2           120          249                      0
## 149   50   1               2           120          168                      0
## 150   54   1               4           130          603                      1
## 151   39   1               2           130          215                      0
## 152   48   1               2           100          159                      0
## 153   40   1               2           130          275                      0
## 154   55   1               4           120          270                      0
## 155   41   1               2           120          291                      0
## 156   56   1               4           155          342                      1
## 157   38   1               4           110          190                      0
## 158   49   1               4           140          185                      0
## 159   44   1               4           130          290                      0
## 160   54   1               2           160          195                      0
## 161   59   1               4           140          264                      1
## 162   49   1               4           128          212                      0
## 163   47   1               2           160          263                      0
## 164   49   0               2           110          208                      0
## 165   42   1               2           120          196                      0
## 166   52   0               2           140          225                      0
## 167   46   1               1           140          272                      1
## 168   50   1               4           140          231                      0
## 169   48   1               2           140          238                      0
## 170   58   1               4           135          222                      0
## 171   58   1               3           140          179                      0
## 172   29   1               2           120          243                      0
## 173   40   1               3           140          235                      0
## 174   53   1               2           140          320                      0
## 175   49   1               3           140          187                      0
## 176   52   1               4           140          266                      0
## 177   43   1               4           140          288                      0
## 178   54   1               4           140          216                      0
## 179   59   1               2           140          287                      0
## 180   37   1               3           130          194                      0
```

```
## 181   46   0                4           130          238                0
## 182   52   1                4           130          225                0
## 183   51   1                2           130          224                0
## 184   52   1                4           140          404                0
## 185   46   1                4           110          238                0
## 186   54   0                2           160          312                0
## 187   58   1                3           160          211                1
## 188   58   1                2           130          251                0
## 189   41   1                4           120          237                1
## 190   50   0                4           120          328                0
## 191   53   1                4           180          285                0
## 192   46   1                4           180          280                0
## 193   50   1                2           170          209                0
## 194   48   1                2           130          245                0
## 195   45   1                3           135          192                0
## 196   41   0                2           125          184                0
## 197   62   0                1           160          193                0
## 198   49   1                4           120          297                0
## 199   42   1                2           150          268                0
## 200   53   1                4           120          246                0
## 201   57   0                1           130          308                0
## 202   47   1                1           110          249                0
## 203   46   1                3           120          230                0
## 204   42   1                3           160          147                0
## 205   31   0                2           100          219                0
## 206   56   1                2           130          184                0
## 207   50   1                4           150          215                0
## 208   35   1                2           120          308                0
## 209   35   1                2           110          257                0
## 210   28   1                2           130          132                0
## 211   54   1                4           125          216                0
## 212   48   1                4           106          263                1
## 213   50   0                3           140          288                0
## 214   56   1                3           130          276                0
## 215   56   0                3           130          219                0
## 216   47   1                4           150          226                0
## 217   30   0                1           170          237                0
## 218   39   1                4           110          280                0
## 219   54   1                3           120          217                0
## 220   55   1                2           140          196                0
## 221   29   1                2           140          263                0
## 222   46   1                4           130          222                0
## 223   51   0                4           160          303                0
## 224   48   0                3           120          195                0
## 225   33   1                3           120          298                0
## 226   55   1                2           120          256                1
## 227   50   1                4           145          264                0
## 228   53   1                3           120          195                0
## 229   38   1                4            92          117                0
## 230   41   1                2           120          295                0
```

```
## 231   37   0                4            130           173                      0
## 232   37   1                4            130           315                      0
## 233   40   1                3            130           281                      0
## 234   38   0                2            120           275                      0
## 235   41   1                4            112           250                      0
## 236   54   0                2            140           309                      0
## 237   39   1                2            120           200                      0
## 238   41   1                4            120           336                      0
## 239   55   1                1            140           295                      0
## 240   48   1                4            160           355                      0
## 241   48   1                4            160           193                      0
## 242   55   1                2            145           326                      0
## 243   54   1                4            200           198                      0
## 244   55   1                2            160           292                      1
## 245   43   0                2            120           266                      0
## 246   48   1                4            160           268                      0
## 247   54   1                1            120           171                      0
## 248   54   1                3            120           237                      0
## 249   48   1                4            122           275                      1
## 250   45   1                4            130           219                      0
## 251   49   1                4            130           341                      0
## 252   44   1                4            135           491                      0
## 253   48   1                4            120           260                      0
## 254   61   1                4            125           292                      0
## 255   62   1                2            140           271                      0
## 256   55   1                4            145           248                      0
## 257   53   0                3            120           274                      0
## 258   55   0                2            130           394                      0
## 259   36   1                3            150           160                      0
## 260   51   0                3            150           200                      0
## 261   55   0                2            122           320                      0
## 262   46   1                2            140           275                      0
## 263   54   0                2            120           221                      0
## 264   46   1                4            120           231                      0
## 265   59   1                4            130           126                      0
## 266   47   1                3            140           193                      0
## 267   54   1                2            160           305                      0
## 268   52   1                4            130           298                      0
## 269   34   1                2             98           220                      0
## 270   54   1                4            130           242                      0
## 271   47   0                3            130           235                      0
## 272   45   1                4            120           225                      0
## 273   32   0                2            105           198                      0
## 274   55   1                4            140           201                      0
## 275   55   1                3            120           220                      0
## 276   45   0                2            180           295                      0
## 277   59   1                3            180           213                      0
## 278   51   1                3            135           160                      0
## 279   52   1                4            170           223                      0
## 280   57   0                4            180           347                      0
```

```
## 281   54   0                  2            130            253                       0
## 282   60   1                  3            120            246                       0
## 283   49   1                  4            150            222                       0
## 284   51   0                  3            130            220                       0
## 285   55   0                  2            110            344                       0
## 286   42   1                  4            140            358                       0
## 287   51   0                  3            110            190                       0
## 288   59   1                  4            140            169                       0
## 289   53   1                  2            120            181                       0
## 290   48   0                  2            133            308                       0
## 291   36   1                  2            120            166                       0
## 292   48   1                  3            110            211                       0
## 293   47   0                  2            140            257                       0
## 294   53   1                  4            130            182                       0
## 418   63   1                  4            140            260                       0
## 419   44   1                  4            130            209                       0
## 420   60   1                  4            132            218                       0
## 421   55   1                  4            142            228                       0
## 422   66   1                  3            110            213                       1
## 424   65   1                  4            150            236                       1
## 427   60   1                  2            160            267                       1
## 428   56   1                  2            126            166                       0
## 433   62   1                  4            120            220                       0
## 434   63   1                  4            170            177                       0
## 435   46   1                  4            110            236                       0
## 445   60   1                  4            130            186                       1
## 446   56   1                  4            120            100                       0
## 447   55   1                  3            136            228                       0
## 449   77   1                  4            124            171                       0
## 450   63   1                  4            160            230                       1
## 454   60   1                  4            140            281                       0
## 456   58   1                  4            136            203                       1
## 462   57   1                  4            139            277                       1
## 464   59   1                  4            122            233                       0
## 467   42   1                  3            134            240                       0
## 470   62   1                  4            152            153                       0
## 471   56   1                  2            124            224                       1
## 475   60   1                  3            141            316                       1
## 478   51   1                  4            132            218                       1
## 480   57   1                  4            130            311                       1
## 484   67   1                  1            142            270                       1
## 487   63   1                  2            139            217                       1
## 488   55   1                  2            110            214                       1
## 489   57   1                  4            140            214                       0
## 490   65   1                  1            140            252                       0
## 491   54   1                  4            136            220                       0
## 492   72   1                  3            120            214                       0
## 493   75   1                  4            170            203                       1
## 495   51   1                  3            137            339                       0
## 496   60   1                  4            142            216                       0
```

```
## 497   64  0          4        142        276           0
## 498   58  1          4        132        458           1
## 499   61  1          4        146        241           0
## 500   67  1          4        160        384           1
## 501   62  1          4        135        297           0
## 502   65  1          4        136        248           0
## 503   63  1          4        130        308           0
## 504   69  1          4        140        208           0
## 505   51  1          4        132        227           1
## 506   62  1          4        158        210           1
## 507   55  1          3        136        245           1
## 508   75  1          4        136        225           0
## 509   40  1          3        106        240           0
## 511   58  1          4        110        198           0
## 512   60  1          4        136        195           0
## 513   63  1          4        160        267           1
## 514   35  1          3        123        161           0
## 515   62  1          1        112        258           0
## 518   68  1          3        150        195           1
## 519   65  1          4        150        235           0
## 521   63  1          4         96        305           0
## 522   64  1          4        130        223           0
## 523   61  1          4        120        282           0
## 524   50  1          4        144        349           0
## 525   59  1          4        124        160           0
## 526   55  1          4        150        160           0
## 527   45  1          3        130        236           0
## 528   65  1          4        144        312           0
## 529   61  1          2        139        283           0
## 530   49  1          3        131        142           0
## 531   72  1          4        143        211           0
## 532   50  1          4        133        218           0
## 533   64  1          4        143        306           1
## 534   55  1          4        116        186           1
## 535   63  1          4        110        252           0
## 536   59  1          4        125        222           0
## 539   74  1          4        150        258           1
## 540   54  1          4        130        202           1
## 541   57  1          4        110        197           0
## 542   62  1          3        138        204           0
## 543   76  1          3        104        113           0
## 544   54  0          4        138        274           0
## 545   70  1          4        170        192           0
## 546   61  0          2        140        298           1
## 547   48  1          4        132        272           0
## 548   48  1          3        132        220           1
## 549   61  1          1        142        200           1
## 550   66  1          4        112        261           0
## 551   68  1          1        139        181           1
## 552   55  1          4        172        260           0
```

```
## 553   62   1                 3           120           220                    0
## 554   71   1                 3           144           221                    0
## 555   74   1                 1           145           216                    1
## 556   53   1                 3           155           175                    1
## 557   58   1                 3           150           219                    0
## 558   75   1                 4           160           310                    1
## 559   56   1                 3           137           208                    1
## 560   58   1                 3           137           232                    0
## 561   64   1                 4           134           273                    0
## 562   54   1                 3           133           203                    0
## 563   54   1                 2           132           182                    0
## 564   59   1                 4           140           274                    0
## 565   55   1                 4           135           204                    1
## 566   57   1                 4           144           270                    1
## 567   61   1                 4           141           292                    0
## 568   41   1                 4           150           171                    0
## 569   71   1                 4           130           221                    0
## 570   38   1                 4           110           289                    0
## 571   55   1                 4           158           217                    0
## 572   56   1                 4           128           223                    0
## 573   69   1                 4           140           110                    1
## 574   64   1                 4           150           193                    0
## 575   72   1                 4           160           123                    1
## 576   69   1                 4           142           210                    1
## 577   56   1                 4           137           282                    1
## 578   62   1                 4           139           170                    0
## 579   67   1                 4           146           369                    0
## 580   57   1                 4           156           173                    0
## 581   69   1                 4           145           289                    1
## 582   51   1                 4           131           152                    1
## 583   48   1                 4           140           208                    0
## 584   69   1                 4           122           216                    1
## 585   69   1                 3           142           271                    0
## 586   64   1                 4           141           244                    1
## 587   57   1                 2           180           285                    1
## 588   53   1                 4           124           243                    0
## 589   37   1                 3           118           240                    0
## 590   67   1                 4           140           219                    0
## 591   74   1                 3           140           237                    1
## 592   63   1                 2           136           165                    0
## 593   58   1                 4           100           213                    0
## 594   61   1                 4           190           287                    1
## 595   64   1                 4           130           258                    1
## 596   58   1                 4           160           256                    1
## 597   60   1                 4           130           186                    1
## 598   57   1                 4           122           264                    0
## 599   55   1                 3           133           185                    0
## 600   55   1                 4           120           226                    0
## 601   56   1                 4           130           203                    1
## 602   57   1                 4           130           207                    0
```

```
## 603   61   1              3          140        284                 0
## 604   61   1              3          120        337                 0
## 605   58   1              3          150        219                 0
## 606   74   1              4          155        310                 0
## 607   68   1              3          134        254                 1
## 608   51   0              4          114        258                 1
## 609   62   1              4          160        254                 1
## 610   53   1              4          144        300                 1
## 611   62   1              4          158        170                 0
## 612   46   1              4          134        310                 0
## 613   54   0              4          127        333                 1
## 614   62   1              1          135        139                 0
## 615   55   1              4          122        223                 1
## 616   58   1              4          140        385                 1
## 617   62   1              2          120        254                 0
## 618   70   1              4          130        322                 0
## 619   67   0              3          115        564                 0
## 620   57   1              2          124        261                 0
## 621   64   1              4          128        263                 0
## 622   74   0              2          120        269                 0
## 623   65   1              4          120        177                 0
## 624   56   1              3          130        256                 1
## 625   59   1              4          110        239                 0
## 626   60   1              4          140        293                 0
## 627   63   0              4          150        407                 0
## 628   59   1              4          135        234                 0
## 629   53   1              4          142        226                 0
## 630   44   1              3          140        235                 0
## 631   61   1              1          134        234                 0
## 632   57   0              4          128        303                 0
## 633   71   0              4          112        149                 0
## 634   46   1              4          140        311                 0
## 635   53   1              4          140        203                 1
## 636   64   1              1          110        211                 0
## 637   40   1              1          140        199                 0
## 638   67   1              4          120        229                 0
## 639   48   1              2          130        245                 0
## 640   43   1              4          115        303                 0
## 641   47   1              4          112        204                 0
## 642   54   0              2          132        288                 1
## 643   48   0              3          130        275                 0
## 644   46   0              4          138        243                 0
## 645   51   0              3          120        295                 0
## 646   58   1              3          112        230                 0
## 647   71   0              3          110        265                 1
## 648   57   1              3          128        229                 0
## 649   66   1              4          160        228                 0
## 650   37   0              3          120        215                 0
## 651   59   1              4          170        326                 0
## 652   50   1              4          144        200                 0
```

```
## 653   48   1                4           130           256                   1
## 654   61   1                4           140           207                   0
## 655   59   1                1           160           273                   0
## 656   42   1                3           130           180                   0
## 657   48   1                4           122           222                   0
## 658   40   1                4           152           223                   0
## 659   62   0                4           124           209                   0
## 660   44   1                3           130           233                   0
## 661   46   1                2           101           197                   1
## 662   59   1                3           126           218                   1
## 663   58   1                3           140           211                   1
## 664   49   1                3           118           149                   0
## 665   44   1                4           110           197                   0
## 666   66   1                2           160           246                   0
## 667   65   0                4           150           225                   0
## 668   42   1                4           136           315                   0
## 669   52   1                2           128           205                   1
## 670   65   0                3           140           417                   1
## 671   63   0                2           140           195                   0
## 672   45   0                2           130           234                   0
## 673   41   0                2           105           198                   0
## 674   61   1                4           138           166                   0
## 675   60   0                3           120           178                   1
## 676   59   0                4           174           249                   0
## 677   62   1                2           120           281                   0
## 678   57   1                3           150           126                   1
## 679   51   0                4           130           305                   0
## 680   44   1                3           120           226                   0
## 681   60   0                1           150           240                   0
## 682   63   1                1           145           233                   1
## 683   57   1                4           150           276                   0
## 684   51   1                4           140           261                   0
## 685   58   0                2           136           319                   1
## 686   44   0                3           118           242                   0
## 687   47   1                3           108           243                   0
## 688   61   1                4           120           260                   0
## 689   57   0                4           120           354                   0
## 690   70   1                2           156           245                   0
## 691   76   0                3           140           197                   0
## 692   67   0                4           106           223                   0
## 693   45   1                4           142           309                   0
## 694   45   1                4           104           208                   0
## 695   39   0                3            94           199                   0
## 696   42   0                3           120           209                   0
## 697   56   1                2           120           236                   0
## 698   58   1                4           146           218                   0
## 699   35   1                4           120           198                   0
## 700   58   1                4           150           270                   0
## 701   41   1                3           130           214                   0
## 702   57   1                4           110           201                   0
```

```
## 703   42   1                 1            148            244                    0
## 704   62   1                 2            128            208                    1
## 705   59   1                 1            178            270                    0
## 706   41   0                 2            126            306                    0
## 707   50   1                 4            150            243                    0
## 708   59   1                 2            140            221                    0
## 709   61   0                 4            130            330                    0
## 710   54   1                 4            124            266                    0
## 711   54   1                 4            110            206                    0
## 712   52   1                 4            125            212                    0
## 713   47   1                 4            110            275                    0
## 714   66   1                 4            120            302                    0
## 715   58   1                 4            100            234                    0
## 716   64   0                 3            140            313                    0
## 717   50   0                 2            120            244                    0
## 718   44   0                 3            108            141                    0
## 719   67   1                 4            120            237                    0
## 720   49   0                 4            130            269                    0
## 721   57   1                 4            165            289                    1
## 722   63   1                 4            130            254                    0
## 723   48   1                 4            124            274                    0
## 724   51   1                 3            100            222                    0
## 725   60   0                 4            150            258                    0
## 726   59   1                 4            140            177                    0
## 727   45   0                 2            112            160                    0
## 728   55   0                 4            180            327                    0
## 729   41   1                 2            110            235                    0
## 730   60   0                 4            158            305                    0
## 731   54   0                 3            135            304                    1
## 732   42   1                 2            120            295                    0
## 733   49   0                 2            134            271                    0
## 734   46   1                 4            120            249                    0
## 735   56   0                 4            200            288                    1
## 736   66   0                 1            150            226                    0
## 737   56   1                 4            130            283                    1
## 738   49   1                 3            120            188                    0
## 739   54   1                 4            122            286                    0
## 740   57   1                 4            152            274                    0
## 741   65   0                 3            160            360                    0
## 742   54   1                 3            125            273                    0
## 743   54   0                 3            160            201                    0
## 744   62   1                 4            120            267                    0
## 745   52   0                 3            136            196                    0
## 746   52   1                 2            134            201                    0
## 747   60   1                 4            117            230                    1
## 748   63   0                 4            108            269                    0
## 749   66   1                 4            112            212                    0
## 750   42   1                 4            140            226                    0
## 751   64   1                 4            120            246                    0
## 752   54   1                 3            150            232                    0
```

```
## 753   46   0                3           142          177                   0
## 754   67   0                3           152          277                   0
## 755   56   1                4           125          249                   1
## 756   34   0                2           118          210                   0
## 757   57   1                4           132          207                   0
## 758   64   1                4           145          212                   0
## 759   59   1                4           138          271                   0
## 760   50   1                3           140          233                   0
## 761   51   1                1           125          213                   0
## 762   54   1                2           192          283                   0
## 763   53   1                4           123          282                   0
## 764   52   1                4           112          230                   0
## 765   40   1                4           110          167                   0
## 766   58   1                3           132          224                   0
## 767   41   0                3           112          268                   0
## 768   41   1                3           112          250                   0
## 769   50   0                3           120          219                   0
## 770   54   0                3           108          267                   0
## 771   64   0                4           130          303                   0
## 772   51   0                3           130          256                   0
## 773   46   0                2           105          204                   0
## 774   55   1                4           140          217                   0
## 775   45   1                2           128          308                   0
## 776   56   1                1           120          193                   0
## 777   66   0                4           178          228                   1
## 778   38   1                1           120          231                   0
## 779   62   0                4           150          244                   0
## 780   55   1                2           130          262                   0
## 781   58   1                4           128          259                   0
## 782   43   1                4           110          211                   0
## 783   64   0                4           180          325                   0
## 784   50   0                4           110          254                   0
## 785   53   1                3           130          197                   1
## 786   45   0                4           138          236                   0
## 787   65   1                1           138          282                   1
## 788   69   1                1           160          234                   1
## 789   69   1                3           140          254                   0
## 790   67   1                4           100          299                   0
## 791   68   0                3           120          211                   0
## 792   34   1                1           118          182                   0
## 793   62   0                4           138          294                   1
## 794   51   1                4           140          298                   0
## 795   46   1                3           150          231                   0
## 796   67   1                4           125          254                   1
## 797   50   1                3           129          196                   0
## 798   42   1                3           120          240                   1
## 799   56   0                4           134          409                   0
## 800   41   1                4           110          172                   0
## 801   42   0                4           102          265                   0
## 802   53   1                3           130          246                   1
```

```
## 803   43   1                  3             130            315                       0
## 804   56   1                  4             132            184                       0
## 805   52   1                  4             108            233                       1
## 806   62   0                  4             140            394                       0
## 807   70   1                  3             160            269                       0
## 808   54   1                  4             140            239                       0
## 809   70   1                  4             145            174                       0
## 810   54   1                  2             108            309                       0
## 811   35   1                  4             126            282                       0
## 812   48   1                  3             124            255                       1
## 813   55   0                  2             135            250                       0
## 814   58   0                  4             100            248                       0
## 815   54   0                  3             110            214                       0
## 816   69   0                  1             140            239                       0
## 817   77   1                  4             125            304                       0
## 818   68   1                  3             118            277                       0
## 819   58   1                  4             125            300                       0
## 820   60   1                  4             125            258                       0
## 821   51   1                  4             140            299                       0
## 822   55   1                  4             160            289                       0
## 823   52   1                  1             152            298                       1
## 824   60   0                  3             102            318                       0
## 825   58   1                  3             105            240                       0
## 826   64   1                  3             125            309                       0
## 827   37   1                  3             130            250                       0
## 828   59   1                  1             170            288                       0
## 829   51   1                  3             125            245                       1
## 830   43   0                  3             122            213                       0
## 831   58   1                  4             128            216                       0
## 832   29   1                  2             130            204                       0
## 833   41   0                  2             130            204                       0
## 834   63   0                  3             135            252                       0
## 835   51   1                  3              94            227                       0
## 836   54   1                  3             120            258                       0
## 837   44   1                  2             120            220                       0
## 838   54   1                  4             110            239                       0
## 839   65   1                  4             135            254                       0
## 840   57   1                  3             150            168                       0
## 841   63   1                  4             130            330                       1
## 842   35   0                  4             138            183                       0
## 843   41   1                  2             135            203                       0
## 844   62   0                  3             130            263                       0
## 845   43   0                  4             132            341                       1
## 846   58   0                  1             150            283                       1
## 847   52   1                  1             118            186                       0
## 848   61   0                  4             145            307                       0
## 849   39   1                  4             118            219                       0
## 850   45   1                  4             115            260                       0
## 851   52   1                  4             128            255                       0
## 852   62   1                  3             130            231                       0
```

```
## 853   62   0                4           160          164                  0
## 854   53   0                4           138          234                  0
## 855   43   1                4           120          177                  0
## 856   47   1                3           138          257                  0
## 857   52   1                2           120          325                  0
## 858   68   1                3           180          274                  1
## 859   39   1                3           140          321                  0
## 860   53   0                4           130          264                  0
## 861   62   0                4           140          268                  0
## 862   51   0                3           140          308                  0
## 863   60   1                4           130          253                  0
## 864   65   1                4           110          248                  0
## 865   65   0                3           155          269                  0
## 866   60   1                3           140          185                  0
## 867   60   1                4           145          282                  0
## 868   54   1                4           120          188                  0
## 869   44   1                2           130          219                  0
## 870   44   1                4           112          290                  0
## 871   51   1                3           110          175                  0
## 872   59   1                3           150          212                  1
## 873   71   0                2           160          302                  0
## 874   61   1                3           150          243                  1
## 875   55   1                4           132          353                  0
## 876   64   1                3           140          335                  0
## 877   43   1                4           150          247                  0
## 878   58   0                3           120          340                  0
## 879   60   1                4           130          206                  0
## 880   58   1                2           120          284                  0
## 881   49   1                2           130          266                  0
## 882   48   1                2           110          229                  0
## 883   52   1                3           172          199                  1
## 884   44   1                2           120          263                  0
## 885   56   0                2           140          294                  0
## 886   57   1                4           140          192                  0
## 887   67   1                4           160          286                  0
## 888   63   1                1           145          233                  1
## 889   67   1                4           160          286                  0
## 890   67   1                4           120          229                  0
## 891   37   1                3           130          250                  0
## 892   41   0                2           130          204                  0
## 893   56   1                2           120          236                  0
## 894   62   0                4           140          268                  0
## 895   57   0                4           120          354                  0
## 896   63   1                4           130          254                  0
## 897   53   1                4           140          203                  1
## 898   57   1                4           140          192                  0
## 899   56   0                2           140          294                  0
## 900   56   1                3           130          256                  1
## 901   44   1                2           120          263                  0
## 902   52   1                3           172          199                  1
```

```
## 903   57   1                3           150          168                 0
## 904   48   1                2           110          229                 0
## 905   54   1                4           140          239                 0
## 906   48   0                3           130          275                 0
## 907   49   1                2           130          266                 0
## 908   64   1                1           110          211                 0
## 909   58   0                1           150          283                 1
## 910   58   1                2           120          284                 0
## 911   58   1                3           132          224                 0
## 912   60   1                4           130          206                 0
## 913   50   0                3           120          219                 0
## 914   58   0                3           120          340                 0
## 915   66   0                1           150          226                 0
## 916   43   1                4           150          247                 0
## 917   40   1                4           110          167                 0
## 918   69   0                1           140          239                 0
## 919   60   1                4           117          230                 1
## 920   64   1                3           140          335                 0
## 921   59   1                4           135          234                 0
## 922   44   1                3           130          233                 0
## 923   42   1                4           140          226                 0
## 924   43   1                4           120          177                 0
## 925   57   1                4           150          276                 0
## 926   55   1                4           132          353                 0
## 927   61   1                3           150          243                 1
## 928   65   0                4           150          225                 0
## 929   40   1                1           140          199                 0
## 930   71   0                2           160          302                 0
## 931   59   1                3           150          212                 1
## 932   61   0                4           130          330                 0
## 933   58   1                3           112          230                 0
## 934   51   1                3           110          175                 0
## 935   50   1                4           150          243                 0
## 936   65   0                3           140          417                 1
## 937   53   1                3           130          197                 1
## 938   41   0                2           105          198                 0
## 939   65   1                4           120          177                 0
## 940   44   1                4           112          290                 0
## 941   44   1                2           130          219                 0
## 942   60   1                4           130          253                 0
## 943   54   1                4           124          266                 0
## 944   50   1                3           140          233                 0
## 945   41   1                4           110          172                 0
## 946   54   1                3           125          273                 0
## 947   51   1                1           125          213                 0
## 948   51   0                4           130          305                 0
## 949   46   0                3           142          177                 0
## 950   58   1                4           128          216                 0
## 951   54   0                3           135          304                 1
## 952   54   1                4           120          188                 0
```

```
## 953   60  1       4       145       282         0
## 954   60  1       3       140       185         0
## 955   54  1       3       150       232         0
## 956   59  1       4       170       326         0
## 957   46  1       3       150       231         0
## 958   65  0       3       155       269         0
## 959   67  1       4       125       254         1
## 960   62  1       4       120       267         0
## 961   65  1       4       110       248         0
## 962   44  1       4       110       197         0
## 963   65  0       3       160       360         0
## 964   60  1       4       125       258         0
## 965   51  0       3       140       308         0
## 966   48  1       2       130       245         0
## 967   58  1       4       150       270         0
## 968   45  1       4       104       208         0
## 969   53  0       4       130       264         0
## 970   39  1       3       140       321         0
## 971   68  1       3       180       274         1
## 972   52  1       2       120       325         0
## 973   44  1       3       140       235         0
## 974   47  1       3       138       257         0
## 975   53  0       3       128       216         0
## 976   53  0       4       138       234         0
## 977   51  0       3       130       256         0
## 978   66  1       4       120       302         0
## 979   62  0       4       160       164         0
## 980   62  1       3       130       231         0
## 981   44  0       3       108       141         0
## 982   63  0       3       135       252         0
## 983   52  1       4       128       255         0
## 984   59  1       4       110       239         0
## 985   60  0       4       150       258         0
## 986   52  1       2       134       201         0
## 987   48  1       4       122       222         0
## 988   45  1       4       115       260         0
## 989   34  1       1       118       182         0
## 990   57  0       4       128       303         0
## 991   71  0       3       110       265         1
## 992   49  1       3       120       188         0
## 993   54  1       2       108       309         0
## 994   59  1       4       140       177         0
## 995   57  1       3       128       229         0
## 996   61  1       4       120       260         0
## 997   39  1       4       118       219         0
## 998   61  0       4       145       307         0
## 999   56  1       4       125       249         1
## 1000  52  1       1       118       186         0
## 1001  43  0       4       132       341         1
## 1002  62  0       3       130       263         0
```

```
## 1003  41   1                   2             135            203                         0
## 1004  58   1                   3             140            211                         1
## 1005  35   0                   4             138            183                         0
## 1006  63   1                   4             130            330                         1
## 1007  65   1                   4             135            254                         0
## 1008  48   1                   4             130            256                         1
## 1009  63   0                   4             150            407                         0
## 1010  51   1                   3             100            222                         0
## 1011  55   1                   4             140            217                         0
## 1012  65   1                   1             138            282                         1
## 1013  45   0                   2             130            234                         0
## 1014  56   0                   4             200            288                         1
## 1015  54   1                   4             110            239                         0
## 1016  44   1                   2             120            220                         0
## 1017  62   0                   4             124            209                         0
## 1018  54   1                   3             120            258                         0
## 1019  51   1                   3              94            227                         0
## 1020  29   1                   2             130            204                         0
## 1021  51   1                   4             140            261                         0
## 1022  43   0                   3             122            213                         0
## 1023  55   0                   2             135            250                         0
## 1024  70   1                   4             145            174                         0
## 1025  62   1                   2             120            281                         0
## 1026  35   1                   4             120            198                         0
## 1027  51   1                   3             125            245                         1
## 1028  59   1                   2             140            221                         0
## 1029  59   1                   1             170            288                         0
## 1030  52   1                   2             128            205                         1
## 1031  64   1                   3             125            309                         0
## 1032  58   1                   3             105            240                         0
## 1033  47   1                   3             108            243                         0
## 1034  57   1                   4             165            289                         1
## 1035  41   1                   3             112            250                         0
## 1036  45   1                   2             128            308                         0
## 1037  60   0                   3             102            318                         0
## 1038  52   1                   1             152            298                         1
## 1039  42   0                   4             102            265                         0
## 1040  67   0                   3             115            564                         0
## 1041  55   1                   4             160            289                         0
## 1042  64   1                   4             120            246                         0
## 1043  70   1                   4             130            322                         0
## 1044  51   1                   4             140            299                         0
## 1045  58   1                   4             125            300                         0
## 1046  60   1                   4             140            293                         0
## 1047  68   1                   3             118            277                         0
## 1048  46   1                   2             101            197                         1
## 1049  77   1                   4             125            304                         0
## 1050  54   0                   3             110            214                         0
## 1051  58   0                   4             100            248                         0
## 1052  48   1                   3             124            255                         1
```

```
## 1053  57   1                4          132          207                     0
## 1054  52   1                3          138          223                     0
## 1055  54   0                2          132          288                     1
## 1056  35   1                4          126          282                     0
## 1057  45   0                2          112          160                     0
## 1058  70   1                3          160          269                     0
## 1059  53   1                4          142          226                     0
## 1060  59   0                4          174          249                     0
## 1061  62   0                4          140          394                     0
## 1062  64   1                4          145          212                     0
## 1063  57   1                4          152          274                     0
## 1064  52   1                4          108          233                     1
## 1065  56   1                4          132          184                     0
## 1066  43   1                3          130          315                     0
## 1067  53   1                3          130          246                     1
## 1068  48   1                4          124          274                     0
## 1069  56   0                4          134          409                     0
## 1070  42   1                1          148          244                     0
## 1071  59   1                1          178          270                     0
## 1072  60   0                4          158          305                     0
## 1073  63   0                2          140          195                     0
## 1074  42   1                3          120          240                     1
## 1075  66   1                2          160          246                     0
## 1076  54   1                2          192          283                     0
## 1077  69   1                3          140          254                     0
## 1078  50   1                3          129          196                     0
## 1079  51   1                4          140          298                     0
## 1080  43   1                4          132          247                     1
## 1081  62   0                4          138          294                     1
## 1082  68   0                3          120          211                     0
## 1083  67   1                4          100          299                     0
## 1084  69   1                1          160          234                     1
## 1085  45   0                4          138          236                     0
## 1086  50   0                2          120          244                     0
## 1087  59   1                1          160          273                     0
## 1088  50   0                4          110          254                     0
## 1089  64   0                4          180          325                     0
## 1090  57   1                3          150          126                     1
## 1091  64   0                3          140          313                     0
## 1092  43   1                4          110          211                     0
## 1093  45   1                4          142          309                     0
## 1094  58   1                4          128          259                     0
## 1095  50   1                4          144          200                     0
## 1096  55   1                2          130          262                     0
## 1097  62   0                4          150          244                     0
## 1098  37   0                3          120          215                     0
## 1099  38   1                1          120          231                     0
## 1100  41   1                3          130          214                     0
## 1101  66   0                4          178          228                     1
## 1102  52   1                4          112          230                     0
```

```
## 1103  56   1                1           120          193                 0
## 1104  46   0                2           105          204                 0
## 1105  46   0                4           138          243                 0
## 1106  64   0                4           130          303                 0
## 1107  59   1                4           138          271                 0
## 1108  41   0                3           112          268                 0
## 1109  54   0                3           108          267                 0
## 1110  39   0                3            94          199                 0
## 1111  53   1                4           123          282                 0
## 1112  63   0                4           108          269                 0
## 1113  34   0                2           118          210                 0
## 1114  47   1                4           112          204                 0
## 1115  67   0                3           152          277                 0
## 1116  54   1                4           110          206                 0
## 1117  66   1                4           112          212                 0
## 1118  52   0                3           136          196                 0
## 1119  55   0                4           180          327                 0
## 1120  49   1                3           118          149                 0
## 1121  74   0                2           120          269                 0
## 1122  54   0                3           160          201                 0
## 1123  54   1                4           122          286                 0
## 1124  56   1                4           130          283                 1
## 1125  46   1                4           120          249                 0
## 1126  49   0                2           134          271                 0
## 1127  42   1                2           120          295                 0
## 1128  41   1                2           110          235                 0
## 1129  41   0                2           126          306                 0
## 1130  49   0                4           130          269                 0
## 1131  61   1                1           134          234                 0
## 1132  60   0                3           120          178                 1
## 1133  67   1                4           120          237                 0
## 1134  58   1                4           100          234                 0
## 1135  47   1                4           110          275                 0
## 1136  52   1                4           125          212                 0
## 1137  62   1                2           128          208                 1
## 1138  57   1                4           110          201                 0
## 1139  58   1                4           146          218                 0
## 1140  64   1                4           128          263                 0
## 1141  51   0                3           120          295                 0
## 1142  43   1                4           115          303                 0
## 1143  42   0                3           120          209                 0
## 1144  67   0                4           106          223                 0
## 1145  76   0                3           140          197                 0
## 1146  70   1                2           156          245                 0
## 1147  57   1                2           124          261                 0
## 1148  44   0                3           118          242                 0
## 1149  58   0                2           136          319                 1
## 1150  60   0                1           150          240                 0
## 1151  44   1                3           120          226                 0
## 1152  61   1                4           138          166                 0
```

```
## 1153  42   1              4          136         315                 0
## 1154  52   1              4          128         204                 1
## 1155  59   1              3          126         218                 1
## 1156  40   1              4          152         223                 0
## 1157  42   1              3          130         180                 0
## 1158  61   1              4          140         207                 0
## 1159  66   1              4          160         228                 0
## 1160  46   1              4          140         311                 0
## 1161  71   0              4          112         149                 0
## 1162  59   1              1          134         204                 0
## 1163  64   1              1          170         227                 0
## 1164  66   0              3          146         278                 0
## 1165  39   0              3          138         220                 0
## 1166  57   1              2          154         232                 0
## 1167  58   0              4          130         197                 0
## 1168  57   1              4          110         335                 0
## 1169  47   1              3          130         253                 0
## 1170  55   0              4          128         205                 0
## 1171  35   1              2          122         192                 0
## 1172  61   1              4          148         203                 0
## 1173  58   1              4          114         318                 0
## 1174  58   0              4          170         225                 1
## 1175  58   1              2          125         220                 0
## 1176  56   1              2          130         221                 0
## 1177  56   1              2          120         240                 0
## 1178  67   1              3          152         212                 0
## 1179  55   0              2          132         342                 0
## 1180  44   1              4          120         169                 0
## 1181  63   1              4          140         187                 0
## 1182  63   0              4          124         197                 0
## 1183  41   1              2          120         157                 0
## 1184  59   1              4          164         176                 1
## 1185  57   0              4          140         241                 0
## 1186  45   1              1          110         264                 0
## 1187  68   1              4          144         193                 1
## 1188  57   1              4          130         131                 0
## 1189  57   0              2          130         236                 0
## 1190  38   1              3          138         175                 0
##       resting.ecg max.heart.rate exercise.angina oldpeak ST.slope target
## 1               0            172               0     0.0        1      0
## 2               0            156               0     1.0        2      1
## 3               1             98               0     0.0        1      0
## 4               0            108               1     1.5        2      1
## 5               0            122               0     0.0        1      0
## 6               0            170               0     0.0        1      0
## 7               0            170               0     0.0        1      0
## 8               0            142               0     0.0        1      0
## 9               0            130               1     1.5        2      1
## 10              0            120               0     0.0        1      0
## 11              0            142               0     0.0        1      0
```

```
## 12              1            99                1     2.0         2      1
## 13              0           145                0     0.0         1      0
## 14              0           140                1     1.0         2      1
## 15              1           137                0     0.0         1      0
## 16              0           150                0     1.5         2      0
## 17              0           166                0     0.0         2      1
## 18              0           165                0     0.0         1      0
## 19              0           125                0     1.0         2      1
## 20              0           160                0     3.0         2      1
## 21              0           142                0     0.0         1      0
## 22              0           142                0     1.0         2      0
## 23              0           164                0     0.0         1      0
## 24              0           150                1     3.0         2      1
## 25              0           138                0     0.0         1      0
## 26              0           178                0     0.0         1      0
## 27              1           112                1     3.0         2      0
## 28              0           118                0     0.0         1      0
## 29              0           127                0     0.0         1      0
## 30              0           145                0     0.0         1      0
## 31              0           130                0     0.0         2      1
## 32              0           114                0     0.0         1      0
## 33              0           122                0     2.0         2      1
## 34              1           130                0     2.0         2      1
## 35              0           154                0     0.0         1      0
## 36              0           155                0     0.0         1      0
## 37              0            87                1     1.5         2      1
## 38              1           142                0     0.0         1      0
## 39              1           148                0     0.0         1      0
## 40              0           130                1     1.0         2      0
## 41              0           130                0     0.0         1      0
## 42              1           100                1     0.0         2      1
## 43              0           168                0     0.0         1      0
## 44              1           170                0     0.0         1      0
## 45              0           120                1     1.0         2      1
## 46              0           120                1     1.0         2      0
## 47              0           168                0     0.0         1      0
## 48              0           170                0     0.0         1      0
## 49              0           184                0     1.0         2      0
## 50              0           170                0     0.0         2      1
## 51              0           121                1     2.0         2      1
## 52              0            98                1     2.0         2      1
## 53              0           122                0     0.0         1      0
## 54              0           150                0     0.0         1      0
## 55              0           140                1     1.5         2      0
## 56              0           170                0     0.0         1      0
## 57              0           153                1     1.5         2      1
## 58              1           140                0     0.0         2      1
## 59              1           134                0     1.0         1      0
## 60              1            96                1     1.0         2      1
## 61              0           174                0     0.0         1      0
```

```
## 62                0             175                  0      0.0          1        0
## 63                0             144                  0      0.0          1        0
## 64                0             125                  1      1.0          2        1
## 65                0             145                  0      0.0          1        0
## 66                0             130                  0      0.0          1        0
## 67                0             144                  0      0.0          1        0
## 68                0             184                  0      0.0          1        0
## 69                1              82                  1      4.0          2        1
## 70                0             170                  0      0.0          1        0
## 71                1             145                  1      1.0          2        1
## 72                0             135                  0      0.0          1        0
## 73                0             150                  0      0.0          2        1
## 74                1             115                  0      0.0          1        0
## 75                0             128                  1      1.5          2        1
## 76                0             116                  0      0.0          1        0
## 77                0             130                  0      0.0          2        1
## 78                0             150                  0      0.0          1        0
## 79                0             138                  1      0.0          1        0
## 80                0             170                  0      0.0          2        1
## 81                0             160                  0      0.0          1        0
## 82                0             154                  0      0.0          1        0
## 83                0             115                  0      0.0          2        1
## 84                0             165                  0      0.0          1        0
## 85                0             125                  1      1.0          2        1
## 86                0              94                  1      1.0          2        1
## 87                0             112                  1      2.0          2        1
## 88                0             142                  1      2.0          2        0
## 89                1             155                  0      0.0          2        1
## 90                0             110                  1      0.5          2        0
## 91                0             160                  0      0.0          1        0
## 92                0             140                  0      0.0          1        0
## 93                0             148                  0      0.0          1        0
## 94                0              92                  1      1.5          2        1
## 95                1             180                  0      0.0          1        0
## 96                0             140                  1      2.0          2        1
## 97                0             138                  0      0.0          1        0
## 98                0             160                  0      0.0          1        0
## 99                0             140                  0      0.0          1        0
## 100               0             144                  0      0.0          1        0
## 101               1             115                  1      1.0          2        1
## 102               0             100                  0      0.0          1        0
## 103               0             130                  0      2.0          2        1
## 104               0             152                  1      1.0          2        1
## 105               0             124                  0      0.0          2        1
## 106               0             140                  0      0.0          1        0
## 107               1             110                  0      0.0          1        0
## 108               1             168                  0      0.0          1        0
## 109               0             135                  0      0.0          1        0
## 110               0             106                  0      0.0          1        0
## 111               0             124                  0      1.0          2        0
```

```
## 112                0           92                 1     3.0         2      1
## 113                0          125                 1     0.0         1      0
## 114                0          150                 0     0.0         1      0
## 115                1          135                 0     0.0         1      0
## 116                0          150                 1     1.0         2      1
## 117                0          170                 0     0.0         2      1
## 118                1          130                 1     1.5         2      1
## 119                1          185                 0     0.0         1      0
## 120                0          180                 0     0.0         2      1
## 121                0          170                 0     0.0         2      1
## 122                0          139                 0     0.0         1      0
## 123                1          140                 0     0.0         1      0
## 124                0          110                 1     1.0         2      1
## 125                0          150                 0     0.0         1      0
## 126                0          110                 0     0.0         1      0
## 127                0          190                 0     0.0         1      0
## 128                0          175                 0     2.0         1      0
## 129                0          140                 0     0.0         1      0
## 130                0          152                 1     1.5         2      0
## 131                0          130                 0     0.0         1      0
## 132                0          150                 1     0.0         2      1
## 133                1          122                 1     2.0         2      1
## 134                1          124                 1     1.5         2      1
## 135                1          120                 1     1.0         2      0
## 136                0          175                 0     0.0         2      1
## 137                1          175                 0     0.0         1      0
## 138                1          146                 0     2.0         1      0
## 139                0          118                 1     0.0         2      1
## 140                0          130                 1     2.0         2      1
## 141                0           94                 1     2.5         2      1
## 142                1          125                 1     2.5         2      1
## 143                1          158                 1     3.0         2      1
## 144                0          155                 0     0.0         1      0
## 145                0          150                 0     1.0         2      1
## 146                0          132                 0     0.0         1      0
## 147                0          155                 0     0.0         1      0
## 148                1          176                 0     0.0         1      0
## 149                0          160                 0     0.0         1      0
## 150                0          125                 1     1.0         2      1
## 151                0          120                 0     0.0         1      0
## 152                0          100                 0     0.0         1      0
## 153                0          150                 0     0.0         1      0
## 154                0          140                 0     0.0         1      0
## 155                1          160                 0     0.0         1      0
## 156                0          150                 1     3.0         2      1
## 157                0          150                 1     1.0         2      1
## 158                0          130                 0     0.0         1      0
## 159                0          100                 1     2.0         2      1
## 160                1          130                 0     1.0         1      0
## 161                2          119                 1     0.0         2      1
```

```
## 162          0        96          1    0.0      2     1
## 163          0       174          0    0.0      1     0
## 164          0       160          0    0.0      1     0
## 165          0       150          0    0.0      1     0
## 166          0       140          0    0.0      1     0
## 167          0       175          0    2.0      2     1
## 168          1       140          1    5.0      2     1
## 169          0       118          0    0.0      1     0
## 170          0       100          0    0.0      1     0
## 171          0       160          0    0.0      1     0
## 172          0       160          0    0.0      1     0
## 173          0       188          0    0.0      1     0
## 174          0       162          0    0.0      1     0
## 175          0       172          0    0.0      1     0
## 176          0       134          1    2.0      2     1
## 177          0       135          1    2.0      2     1
## 178          0       105          0    1.5      2     1
## 179          0       150          0    0.0      1     0
## 180          0       150          0    0.0      1     0
## 181          0        90          0    0.0      1     0
## 182          0       120          1    2.0      2     1
## 183          0       150          0    0.0      1     0
## 184          0       124          1    2.0      2     1
## 185          1       140          1    1.0      2     0
## 186          0       130          0    0.0      1     0
## 187          1        92          0    0.0      2     1
## 188          0       110          0    0.0      1     0
## 189          0       138          1    1.0      2     1
## 190          0       110          1    1.0      2     0
## 191          1       120          1    1.5      2     1
## 192          1       120          0    0.0      1     0
## 193          1       116          0    0.0      1     0
## 194          0       160          0    0.0      1     0
## 195          0       110          0    0.0      1     0
## 196          0       180          0    0.0      1     0
## 197          0       116          0    0.0      1     0
## 198          0       132          0    1.0      2     0
## 199          0       136          0    0.0      1     0
## 200          0       116          1    0.0      2     1
## 201          0        98          0    1.0      2     0
## 202          0       150          0    0.0      1     0
## 203          0       150          0    0.0      1     0
## 204          0       146          0    0.0      1     0
## 205          1       150          0    0.0      1     0
## 206          0       100          0    0.0      1     0
## 207          0       140          1    0.0      1     0
## 208          2       180          0    0.0      1     0
## 209          0       140          0    0.0      2     1
## 210          2       185          0    0.0      1     0
## 211          0       140          0    0.0      2     1
```

```
## 212           0         110          0    0.0        2      1
## 213           0         140          1    0.0        2      1
## 214           0         128          1    1.0        1      0
## 215           1         164          0    0.0        1      0
## 216           0          98          1    1.5        2      1
## 217           1         170          0    0.0        1      0
## 218           0         150          0    0.0        2      1
## 219           0         137          0    0.0        1      0
## 220           0         150          0    0.0        1      0
## 221           0         170          0    0.0        1      0
## 222           0         112          0    0.0        2      1
## 223           0         150          1    1.0        2      1
## 224           0         125          0    0.0        1      0
## 225           0         185          0    0.0        1      0
## 226           0         137          0    0.0        1      0
## 227           0         150          0    0.0        2      1
## 228           0         140          0    0.0        1      0
## 229           0         134          1    2.5        2      1
## 230           0         170          0    0.0        1      0
## 231           1         184          0    0.0        1      0
## 232           0         158          0    0.0        1      0
## 233           0         167          0    0.0        1      0
## 234           0         129          0    0.0        1      0
## 235           0         142          0    0.0        1      0
## 236           1         140          0    0.0        1      0
## 237           0         160          1    1.0        2      0
## 238           0         118          1    3.0        2      1
## 239           0         136          0    0.0        2      1
## 240           0          99          1    2.0        2      1
## 241           0         102          1    3.0        2      1
## 242           0         155          0    0.0        1      0
## 243           0         142          1    2.0        2      1
## 244           0         143          1    2.0        2      1
## 245           0         118          0    0.0        1      0
## 246           0         103          1    1.0        2      1
## 247           0         137          0    2.0        1      0
## 248           0         150          1    1.5        2      1
## 249           1         150          1    2.0        3      1
## 250           1         130          1    1.0        2      1
## 251           0         120          1    1.0        2      1
## 252           0         135          0    0.0        2      1
## 253           0         115          0    2.0        2      1
## 254           1         115          1    0.0        1      0
## 255           0         152          0    1.0        1      0
## 256           0          96          1    2.0        2      1
## 257           0         130          0    0.0        1      0
## 258           2         150          0    0.0        1      0
## 259           0         172          0    0.0        1      0
## 260           0         120          0    0.5        1      0
## 261           0         155          0    0.0        1      0
```

```
## 262      0        165         1   0.0     1    0
## 263      0        138         0   1.0     1    0
## 264      0        115         1   0.0     2    1
## 265      0        125         0   0.0     2    1
## 266      0        145         1   1.0     2    1
## 267      0        175         0   0.0     1    0
## 268      0        110         1   1.0     2    1
## 269      0        150         0   0.0     1    0
## 270      0         91         1   1.0     2    1
## 271      0        145         0   2.0     2    0
## 272      0        140         0   0.0     1    0
## 273      0        165         0   0.0     1    0
## 274      0        130         1   3.0     2    1
## 275      2        134         0   0.0     1    0
## 276      0        180         0   0.0     1    0
## 277      0        100         0   0.0     1    0
## 278      0        150         0   2.0     2    1
## 279      0        126         1   1.5     2    1
## 280      1        126         1   0.8     2    0
## 281      1        155         0   0.0     1    0
## 282      2        135         0   0.0     1    0
## 283      0        122         0   2.0     2    1
## 284      0        160         1   2.0     1    0
## 285      1        160         0   0.0     1    0
## 286      0        170         0   0.0     1    0
## 287      0        120         0   0.0     1    0
## 288      0        140         0   0.0     1    0
## 289      0        132         0   0.0     1    0
## 290      1        156         0   2.0     1    0
## 291      0        180         0   0.0     1    0
## 292      0        138         0   0.0     1    0
## 293      0        135         0   1.0     1    0
## 294      0        148         0   0.0     1    0
## 418      1        112         1   3.0     2    1
## 419      1        127         0   0.0     1    0
## 420      1        140         1   1.5     3    1
## 421      1        149         1   2.5     1    1
## 422      2         99         1   1.3     2    0
## 424      1        105         1   0.0     2    1
## 427      1        157         0   0.5     2    1
## 428      1        140         0   0.0     1    0
## 433      1         86         0   0.0     1    0
## 434      0         84         1   2.5     3    1
## 435      0        125         1   2.0     2    1
## 445      1        140         1   0.5     2    1
## 446      0        120         1   1.5     2    1
## 447      1        124         1   1.6     2    1
## 449      1        110         1   2.0     1    1
## 450      0        105         1   1.0     2    1
## 454      1        118         1   1.5     2    1
```

```
## 456                0             123                 1      1.2          2       1
## 462                1             118                 1      1.9          2       1
## 464                0             117                 1      1.3          3       1
## 467                0             160                 0      0.0          1       0
## 470                1              97                 1      1.6          1       1
## 471                0             161                 0      2.0          2       0
## 475                1             122                 1      1.7          2       1
## 478                2             139                 0      0.1          1       0
## 480                1             148                 1      2.0          2       1
## 484                0             125                 0      2.5          1       1
## 487                1             128                 1      1.2          2       1
## 488                1             180                 0      0.4          1       0
## 489                1             144                 1      2.0          2       1
## 490                0             135                 0      0.3          1       0
## 491                0             140                 1      3.0          2       1
## 492                0             102                 1      1.0          2       1
## 493                1             108                 0      0.0          2       1
## 495                0             127                 1      1.7          2       1
## 496                0             110                 1      2.5          2       1
## 497                0             140                 1      1.0          2       1
## 498                0              69                 0      1.0          3       0
## 499                0             148                 1      3.0          3       1
## 500                1             130                 1      0.0          2       1
## 501                0             130                 1      1.0          2       1
## 502                0             140                 1      4.0          3       1
## 503                0             138                 1      2.0          2       1
## 504                1             140                 1      2.0          2       1
## 505                1             138                 0      0.2          1       0
## 506                0             112                 1      3.0          3       1
## 507                1             131                 1      1.2          2       1
## 508                0             112                 1      3.0          2       1
## 509                0              80                 1      0.0          1       0
## 511                0             110                 0      0.0          2       1
## 512                0             126                 0      0.3          1       0
## 513                1              88                 1      2.0          2       1
## 514                1             153                 0     -0.1          1       0
## 515                1             150                 1      1.3          2       1
## 518                0             132                 0      0.0          0       1
## 519                0             120                 1      1.5          2       1
## 521                1             121                 1      1.0          1       1
## 522                1             128                 0      0.5          2       0
## 523                1             135                 1      4.0          3       1
## 524                2             120                 1      1.0          1       1
## 525                0             117                 1      1.0          2       1
## 526                1             150                 0      0.0          1       0
## 527                0             144                 0      0.1          1       0
## 528                2             113                 1      1.7          2       1
## 529                0             135                 0      0.3          1       0
## 530                0             127                 1      1.5          2       1
## 531                0             109                 1      1.4          2       1
```

```
## 532            0           128                1      1.1          2       1
## 533            1           115                1      1.8          2       1
## 534            1           102                0      0.0          2       1
## 535            1           140                1      2.0          2       1
## 536            0           135                1      2.5          3       1
## 539            1           130                1      4.0          3       1
## 540            0           112                1      2.0          2       1
## 541            2           100                0      0.0          1       0
## 542            1           122                1      1.2          2       1
## 543            2           120                0      3.5          3       1
## 544            0           105                1      1.5          2       1
## 545            1           129                1      3.0          3       1
## 546            0           120                1      0.0          1       0
## 547            1           139                0      0.2          1       0
## 548            1           162                0      0.0          2       1
## 549            1           100                0      1.5          3       1
## 550            0           140                0      1.5          1       1
## 551            1           135                0      0.2          1       0
## 552            0            73                0      2.0          2       1
## 553            2            86                0      0.0          1       0
## 554            0           108                1      1.8          2       1
## 555            0           116                1      1.8          2       1
## 556            1           160                0      0.3          1       0
## 557            1           118                1      0.0          2       1
## 558            0           112                1      2.0          3       0
## 559            1           122                1      1.8          2       1
## 560            1           124                1      1.4          2       1
## 561            0           102                1      4.0          3       1
## 562            1           137                0      0.2          1       0
## 563            1           141                0      0.1          1       0
## 564            0           154                1      2.0          2       0
## 565            1           126                1      1.1          2       1
## 566            1           160                1      2.0          2       1
## 567            1           115                1      1.7          2       1
## 568            0           128                1      1.5          2       0
## 569            1           115                1      0.0          2       1
## 570            0           105                1      1.5          3       1
## 571            0           110                1      2.5          2       1
## 572            1           119                1      2.0          3       1
## 573            0           109                1      1.5          2       1
## 574            1           135                1      0.5          2       1
## 575            2           130                0      1.5          2       1
## 576            1           112                1      1.5          2       1
## 577            0           126                1      1.2          2       1
## 578            1           120                1      3.0          2       1
## 579            0           110                1      1.9          2       1
## 580            2           119                1      3.0          3       1
## 581            1           110                1      1.8          2       1
## 582            2           130                1      1.0          2       1
## 583            0           159                1      1.5          1       1
```

```
## 584              2          84          1      0.0       2       1
## 585              2         126          0      0.3       1       0
## 586              1         116          1      1.5       2       1
## 587              1         120          0      0.8       2       1
## 588              0         122          1      2.0       2       1
## 589              2         165          0      1.0       2       0
## 590              1         122          1      2.0       2       1
## 591              0          94          0      0.0       2       1
## 592              1         133          0      0.2       1       0
## 593              1         110          0      0.0       1       0
## 594              2         150          1      2.0       3       1
## 595              2         130          0      0.0       2       1
## 596              2         113          1      1.0       1       1
## 597              2         140          1      0.5       2       1
## 598              2         100          0      0.0       2       1
## 599              1         136          0      0.2       1       0
## 600              2         127          1      1.7       3       1
## 601              0          98          0      1.5       2       1
## 602              1          96          1      1.0       2       0
## 603              0         123          1      1.3       2       1
## 604              0          98          1      0.0       2       1
## 605              1         118          1      0.0       2       1
## 606              0         112          1      1.5       3       1
## 607              0         151          1      0.0       1       0
## 608              2          96          0      1.0       1       0
## 609              1         108          1      3.0       2       1
## 610              1         128          1      1.5       2       1
## 611              1         138          1      0.0       2       1
## 612              0         126          0      0.0       2       1
## 613              1         154          0      0.0       2       1
## 614              1         137          0      0.2       1       0
## 615              1         100          0      0.0       2       1
## 616              2         135          0      0.3       1       0
## 617              2          93          1      0.0       2       1
## 618              2         109          0      2.4       2       1
## 619              2         160          0      1.6       2       0
## 620              0         141          0      0.3       1       1
## 621              0         105          1      0.2       2       0
## 622              2         121          1      0.2       1       0
## 623              0         140          0      0.4       1       0
## 624              2         142          1      0.6       2       1
## 625              2         142          1      1.2       2       1
## 626              2         170          0      1.2       2       1
## 627              2         154          0      4.0       2       1
## 628              0         161          0      0.5       2       0
## 629              2         111          1      0.0       1       0
## 630              2         180          0      0.0       1       0
## 631              0         145          0      2.6       2       1
## 632              2         159          0      0.0       1       0
## 633              0         125          0      1.6       2       0
```

```
## 634                0            120                 1      1.8            2       1
## 635                2            155                 1      3.1            3       1
## 636                2            144                 1      1.8            2       0
## 637                0            178                 1      1.4            1       0
## 638                2            129                 1      2.6            2       1
## 639                2            180                 0      0.2            2       0
## 640                0            181                 0      1.2            2       0
## 641                0            143                 0      0.1            1       0
## 642                2            159                 1      0.0            1       0
## 643                0            139                 0      0.2            1       0
## 644                2            152                 1      0.0            2       0
## 645                2            157                 0      0.6            1       0
## 646                2            165                 0      2.5            2       1
## 647                2            130                 0      0.0            1       0
## 648                2            150                 0      0.4            2       1
## 649                2            138                 0      2.3            1       0
## 650                0            170                 0      0.0            1       0
## 651                2            140                 1      3.4            3       1
## 652                2            126                 1      0.9            2       1
## 653                2            150                 1      0.0            1       1
## 654                2            138                 1      1.9            1       1
## 655                2            125                 0      0.0            1       1
## 656                0            150                 0      0.0            1       0
## 657                2            186                 0      0.0            1       0
## 658                0            181                 0      0.0            1       1
## 659                0            163                 0      0.0            1       0
## 660                0            179                 1      0.4            1       0
## 661                0            156                 0      0.0            1       0
## 662                0            134                 0      2.2            2       1
## 663                2            165                 0      0.0            1       0
## 664                2            126                 0      0.8            1       1
## 665                2            177                 0      0.0            1       1
## 666                0            120                 1      0.0            2       1
## 667                2            114                 0      1.0            2       1
## 668                0            125                 1      1.8            2       1
## 669                0            184                 0      0.0            1       0
## 670                2            157                 0      0.8            1       0
## 671                0            179                 0      0.0            1       0
## 672                2            175                 0      0.6            2       0
## 673                0            168                 0      0.0            1       0
## 674                2            125                 1      3.6            2       1
## 675                0             96                 0      0.0            1       0
## 676                0            143                 1      0.0            2       1
## 677                2            103                 0      1.4            2       1
## 678                0            173                 0      0.2            1       0
## 679                0            142                 1      1.2            2       1
## 680                0            169                 0      0.0            1       0
## 681                0            171                 0      0.9            1       0
## 682                2            150                 0      2.3            3       0
## 683                2            112                 1      0.6            2       1
```

```
## 684            2             186               1     0.0        1      0
## 685            2             152               0     0.0        1      1
## 686            0             149               0     0.3        2      0
## 687            0             152               0     0.0        1      1
## 688            0             140               1     3.6        2      1
## 689            0             163               1     0.6        1      0
## 690            2             143               0     0.0        1      0
## 691            1             116               0     1.1        2      0
## 692            0             142               0     0.3        1      0
## 693            2             147               1     0.0        2      1
## 694            2             148               1     3.0        2      0
## 695            0             179               0     0.0        1      0
## 696            0             173               0     0.0        2      0
## 697            0             178               0     0.8        1      0
## 698            0             105               0     2.0        2      1
## 699            0             130               1     1.6        2      1
## 700            2             111               1     0.8        1      1
## 701            2             168               0     2.0        2      0
## 702            0             126               1     1.5        2      0
## 703            2             178               0     0.8        1      0
## 704            2             140               0     0.0        1      0
## 705            2             145               0     4.2        3      0
## 706            0             163               0     0.0        1      0
## 707            2             128               0     2.6        2      1
## 708            0             164               1     0.0        1      0
## 709            2             169               0     0.0        1      1
## 710            2             109               1     2.2        2      1
## 711            2             108               1     0.0        2      1
## 712            0             168               0     1.0        1      1
## 713            2             118               1     1.0        2      1
## 714            2             151               0     0.4        2      0
## 715            0             156               0     0.1        1      1
## 716            0             133               0     0.2        1      0
## 717            0             162               0     1.1        1      0
## 718            0             175               0     0.6        2      0
## 719            0              71               0     1.0        2      1
## 720            0             163               0     0.0        1      0
## 721            2             124               0     1.0        2      1
## 722            2             147               0     1.4        2      1
## 723            2             166               0     0.5        2      1
## 724            0             143               1     1.2        2      0
## 725            2             157               0     2.6        2      1
## 726            0             162               1     0.0        1      1
## 727            0             138               0     0.0        2      0
## 728            1             117               1     3.4        2      1
## 729            0             153               0     0.0        1      0
## 730            2             161               0     0.0        1      1
## 731            0             170               0     0.0        1      0
## 732            0             162               0     0.0        1      0
## 733            0             162               0     0.0        2      0
```

```
## 734                 2            144                 0      0.8          1       1
## 735                 2            133                 1      4.0          3       1
## 736                 0            114                 0      2.6          3       0
## 737                 2            103                 1      1.6          3       1
## 738                 0            139                 0      2.0          2       1
## 739                 2            116                 1      3.2          2       1
## 740                 0             88                 1      1.2          2       1
## 741                 2            151                 0      0.8          1       0
## 742                 2            152                 0      0.5          3       0
## 743                 0            163                 0      0.0          1       0
## 744                 0             99                 1      1.8          2       1
## 745                 2            169                 0      0.1          2       0
## 746                 0            158                 0      0.8          1       0
## 747                 0            160                 1      1.4          1       1
## 748                 0            169                 1      1.8          2       1
## 749                 2            132                 1      0.1          1       1
## 750                 0            178                 0      0.0          1       0
## 751                 2             96                 1      2.2          3       1
## 752                 2            165                 0      1.6          1       0
## 753                 2            160                 1      1.4          3       0
## 754                 0            172                 0      0.0          1       0
## 755                 2            144                 1      1.2          2       1
## 756                 0            192                 0      0.7          1       0
## 757                 0            168                 1      0.0          1       0
## 758                 2            132                 0      2.0          2       1
## 759                 2            182                 0      0.0          1       0
## 760                 0            163                 0      0.6          2       1
## 761                 2            125                 1      1.4          1       0
## 762                 2            195                 0      0.0          1       1
## 763                 0             95                 1      2.0          2       1
## 764                 0            160                 0      0.0          1       1
## 765                 2            114                 1      2.0          2       1
## 766                 2            173                 0      3.2          1       1
## 767                 2            172                 1      0.0          1       0
## 768                 0            179                 0      0.0          1       0
## 769                 0            158                 0      1.6          2       0
## 770                 2            167                 0      0.0          1       0
## 771                 0            122                 0      2.0          2       0
## 772                 2            149                 0      0.5          1       0
## 773                 0            172                 0      0.0          1       0
## 774                 0            111                 1      5.6          3       1
## 775                 2            170                 0      0.0          1       0
## 776                 2            162                 0      1.9          2       0
## 777                 0            165                 1      1.0          2       1
## 778                 0            182                 1      3.8          2       1
## 779                 0            154                 1      1.4          2       1
## 780                 0            155                 0      0.0          1       0
## 781                 2            130                 1      3.0          2       1
## 782                 0            161                 0      0.0          1       0
## 783                 0            154                 1      0.0          1       0
```

```
## 784            2        159        0     0.0      1     0
## 785            2        152        0     1.2      3     0
## 786            2        152        1     0.2      2     0
## 787            2        174        0     1.4      2     1
## 788            2        131        0     0.1      2     0
## 789            2        146        0     2.0      2     1
## 790            2        125        1     0.9      2     1
## 791            2        115        0     1.5      2     0
## 792            2        174        0     0.0      1     0
## 793            0        106        0     1.9      2     1
## 794            0        122        1     4.2      2     1
## 795            0        147        0     3.6      2     1
## 796            0        163        0     0.2      2     1
## 797            0        163        0     0.0      1     0
## 798            0        194        0     0.8      3     0
## 799            2        150        1     1.9      2     1
## 800            2        158        0     0.0      1     1
## 801            2        122        0     0.6      2     0
## 802            2        173        0     0.0      1     0
## 803            0        162        0     1.9      1     0
## 804            2        105        1     2.1      2     1
## 805            0        147        0     0.1      1     0
## 806            2        157        0     1.2      2     0
## 807            0        112        1     2.9      2     1
## 808            0        160        0     1.2      1     0
## 809            0        125        1     2.6      3     1
## 810            0        156        0     0.0      1     0
## 811            2        156        1     0.0      1     1
## 812            0        175        0     0.0      1     0
## 813            2        161        0     1.4      2     0
## 814            2        122        0     1.0      2     0
## 815            0        158        0     1.6      2     0
## 816            0        151        0     1.8      1     0
## 817            2        162        1     0.0      1     1
## 818            0        151        0     1.0      1     0
## 819            2        171        0     0.0      1     1
## 820            2        141        1     2.8      2     1
## 821            0        173        1     1.6      1     1
## 822            2        145        1     0.8      2     1
## 823            0        178        0     1.2      2     0
## 824            0        160        0     0.0      1     0
## 825            2        154        1     0.6      2     0
## 826            0        131        1     1.8      2     1
## 827            0        187        0     3.5      3     0
## 828            2        159        0     0.2      2     1
## 829            2        166        0     2.4      2     0
## 830            0        165        0     0.2      2     0
## 831            2        131        1     2.2      2     1
## 832            2        202        0     0.0      1     0
## 833            2        172        0     1.4      1     0
```

```
## 834          2          172          0     0.0      1      0
## 835          0          154          1     0.0      1      0
## 836          2          147          0     0.4      2      0
## 837          0          170          0     0.0      1      0
## 838          0          126          1     2.8      2      1
## 839          2          127          0     2.8      2      1
## 840          0          174          0     1.6      1      0
## 841          2          132          1     1.8      1      1
## 842          0          182          0     1.4      1      0
## 843          0          132          0     0.0      2      0
## 844          0           97          0     1.2      2      1
## 845          2          136          1     3.0      2      1
## 846          2          162          0     1.0      1      0
## 847          2          190          0     0.0      2      0
## 848          2          146          1     1.0      2      1
## 849          0          140          0     1.2      2      1
## 850          2          185          0     0.0      1      0
## 851          0          161          1     0.0      1      1
## 852          0          146          0     1.8      2      0
## 853          2          145          0     6.2      3      1
## 854          2          160          0     0.0      1      0
## 855          2          120          1     2.5      2      1
## 856          2          156          0     0.0      1      0
## 857          0          172          0     0.2      1      0
## 858          2          150          1     1.6      2      1
## 859          2          182          0     0.0      1      0
## 860          2          143          0     0.4      2      0
## 861          2          160          0     3.6      3      1
## 862          2          142          0     1.5      1      0
## 863          0          144          1     1.4      1      1
## 864          2          158          0     0.6      1      1
## 865          0          148          0     0.8      1      0
## 866          2          155          0     3.0      2      1
## 867          2          142          1     2.8      2      1
## 868          0          113          0     1.4      2      1
## 869          2          188          0     0.0      1      0
## 870          2          153          0     0.0      1      1
## 871          0          123          0     0.6      1      0
## 872          0          157          0     1.6      1      0
## 873          0          162          0     0.4      1      0
## 874          0          137          1     1.0      2      0
## 875          0          132          1     1.2      2      1
## 876          0          158          0     0.0      1      1
## 877          0          171          0     1.5      1      0
## 878          0          172          0     0.0      1      0
## 879          2          132          1     2.4      2      1
## 880          2          160          0     1.8      2      1
## 881          0          171          0     0.6      1      0
## 882          0          168          0     1.0      3      1
## 883          0          162          0     0.5      1      0
```

```
## 884            0          173          0     0.0       1     0
## 885            2          153          0     1.3       2     0
## 886            0          148          0     0.4       2     0
## 887            2          108          1     1.5       2     1
## 888            2          150          0     2.3       3     0
## 889            2          108          1     1.5       2     1
## 890            2          129          1     2.6       2     1
## 891            0          187          0     3.5       3     0
## 892            2          172          0     1.4       1     0
## 893            0          178          0     0.8       1     0
## 894            2          160          0     3.6       3     1
## 895            0          163          1     0.6       1     0
## 896            2          147          0     1.4       2     1
## 897            2          155          1     3.1       3     1
## 898            0          148          0     0.4       2     0
## 899            2          153          0     1.3       2     0
## 900            2          142          1     0.6       2     1
## 901            0          173          0     0.0       1     0
## 902            0          162          0     0.5       1     0
## 903            0          174          0     1.6       1     0
## 904            0          168          0     1.0       3     1
## 905            0          160          0     1.2       1     0
## 906            0          139          0     0.2       1     0
## 907            0          171          0     0.6       1     0
## 908            2          144          1     1.8       2     0
## 909            2          162          0     1.0       1     0
## 910            2          160          0     1.8       2     1
## 911            2          173          0     3.2       1     1
## 912            2          132          1     2.4       2     1
## 913            0          158          0     1.6       2     0
## 914            0          172          0     0.0       1     0
## 915            0          114          0     2.6       3     0
## 916            0          171          0     1.5       1     0
## 917            2          114          1     2.0       2     1
## 918            0          151          0     1.8       1     0
## 919            0          160          1     1.4       1     1
## 920            0          158          0     0.0       1     1
## 921            0          161          0     0.5       2     0
## 922            0          179          1     0.4       1     0
## 923            0          178          0     0.0       1     0
## 924            2          120          1     2.5       2     1
## 925            2          112          1     0.6       2     1
## 926            0          132          1     1.2       2     1
## 927            0          137          1     1.0       2     0
## 928            2          114          0     1.0       2     1
## 929            0          178          1     1.4       1     0
## 930            0          162          0     0.4       1     0
## 931            0          157          0     1.6       1     0
## 932            2          169          0     0.0       1     1
## 933            2          165          0     2.5       2     1
```

```
## 934                   0             123                  0      0.6          1       0
## 935                   2             128                  0      2.6          2       1
## 936                   2             157                  0      0.8          1       0
## 937                   2             152                  0      1.2          3       0
## 938                   0             168                  0      0.0          1       0
## 939                   0             140                  0      0.4          1       0
## 940                   2             153                  0      0.0          1       1
## 941                   2             188                  0      0.0          1       0
## 942                   0             144                  1      1.4          1       1
## 943                   2             109                  1      2.2          2       1
## 944                   0             163                  0      0.6          2       1
## 945                   2             158                  0      0.0          1       1
## 946                   2             152                  0      0.5          3       0
## 947                   2             125                  1      1.4          1       0
## 948                   0             142                  1      1.2          2       1
## 949                   2             160                  1      1.4          3       0
## 950                   2             131                  1      2.2          2       1
## 951                   0             170                  0      0.0          1       0
## 952                   0             113                  0      1.4          2       1
## 953                   2             142                  1      2.8          2       1
## 954                   2             155                  0      3.0          2       1
## 955                   2             165                  0      1.6          1       0
## 956                   2             140                  1      3.4          3       1
## 957                   0             147                  0      3.6          2       1
## 958                   0             148                  0      0.8          1       0
## 959                   0             163                  0      0.2          2       1
## 960                   0              99                  1      1.8          2       1
## 961                   2             158                  0      0.6          1       1
## 962                   2             177                  0      0.0          1       1
## 963                   2             151                  0      0.8          1       0
## 964                   2             141                  1      2.8          2       1
## 965                   2             142                  0      1.5          1       0
## 966                   2             180                  0      0.2          2       0
## 967                   2             111                  1      0.8          1       1
## 968                   2             148                  1      3.0          2       0
## 969                   2             143                  0      0.4          2       0
## 970                   2             182                  0      0.0          1       0
## 971                   2             150                  1      1.6          2       1
## 972                   0             172                  0      0.2          1       0
## 973                   2             180                  0      0.0          1       0
## 974                   2             156                  0      0.0          1       0
## 975                   2             115                  0      0.0          1       0
## 976                   2             160                  0      0.0          1       0
## 977                   2             149                  0      0.5          1       0
## 978                   2             151                  0      0.4          2       0
## 979                   2             145                  0      6.2          3       1
## 980                   0             146                  0      1.8          2       0
## 981                   0             175                  0      0.6          2       0
## 982                   2             172                  0      0.0          1       0
## 983                   0             161                  1      0.0          1       1
```

```
## 984           2            142             1      1.2          2      1
## 985           2            157             0      2.6          2      1
## 986           0            158             0      0.8          1      0
## 987           2            186             0      0.0          1      0
## 988           2            185             0      0.0          1      0
## 989           2            174             0      0.0          1      0
## 990           2            159             0      0.0          1      0
## 991           2            130             0      0.0          1      0
## 992           0            139             0      2.0          2      1
## 993           0            156             0      0.0          1      0
## 994           0            162             1      0.0          1      1
## 995           2            150             0      0.4          2      1
## 996           0            140             1      3.6          2      1
## 997           0            140             0      1.2          2      1
## 998           2            146             1      1.0          2      1
## 999           2            144             1      1.2          2      1
## 1000          2            190             0      0.0          2      0
## 1001          2            136             1      3.0          2      1
## 1002          0             97             0      1.2          2      1
## 1003          0            132             0      0.0          2      0
## 1004          2            165             0      0.0          1      0
## 1005          0            182             0      1.4          1      0
## 1006          2            132             1      1.8          1      1
## 1007          2            127             0      2.8          2      1
## 1008          2            150             1      0.0          1      1
## 1009          2            154             0      4.0          2      1
## 1010          0            143             1      1.2          2      0
## 1011          0            111             1      5.6          3      1
## 1012          2            174             0      1.4          2      1
## 1013          2            175             0      0.6          2      0
## 1014          2            133             1      4.0          3      1
## 1015          0            126             1      2.8          2      1
## 1016          0            170             0      0.0          1      0
## 1017          0            163             0      0.0          1      0
## 1018          2            147             0      0.4          2      0
## 1019          0            154             1      0.0          1      0
## 1020          2            202             0      0.0          1      0
## 1021          2            186             1      0.0          1      0
## 1022          0            165             0      0.2          2      0
## 1023          2            161             0      1.4          2      0
## 1024          0            125             1      2.6          3      1
## 1025          2            103             0      1.4          2      1
## 1026          0            130             1      1.6          2      1
## 1027          2            166             0      2.4          2      0
## 1028          0            164             1      0.0          1      0
## 1029          2            159             0      0.2          2      1
## 1030          0            184             0      0.0          1      0
## 1031          0            131             1      1.8          2      1
## 1032          2            154             1      0.6          2      0
## 1033          0            152             0      0.0          1      1
```

```
## 1034          2         124         0    1.0      2     1
## 1035          0         179         0    0.0      1     0
## 1036          2         170         0    0.0      1     0
## 1037          0         160         0    0.0      1     0
## 1038          0         178         0    1.2      2     0
## 1039          2         122         0    0.6      2     0
## 1040          2         160         0    1.6      2     0
## 1041          2         145         1    0.8      2     1
## 1042          2          96         1    2.2      3     1
## 1043          2         109         0    2.4      2     1
## 1044          0         173         1    1.6      1     1
## 1045          2         171         0    0.0      1     1
## 1046          2         170         0    1.2      2     1
## 1047          0         151         0    1.0      1     0
## 1048          0         156         0    0.0      1     0
## 1049          2         162         1    0.0      1     1
## 1050          0         158         0    1.6      2     0
## 1051          2         122         0    1.0      2     0
## 1052          0         175         0    0.0      1     0
## 1053          0         168         1    0.0      1     0
## 1054          0         169         0    0.0      1     0
## 1055          2         159         1    0.0      1     0
## 1056          2         156         1    0.0      1     1
## 1057          0         138         0    0.0      2     0
## 1058          0         112         1    2.9      2     1
## 1059          2         111         1    0.0      1     0
## 1060          0         143         1    0.0      2     1
## 1061          2         157         0    1.2      2     0
## 1062          2         132         0    2.0      2     1
## 1063          0          88         1    1.2      2     1
## 1064          0         147         0    0.1      1     0
## 1065          2         105         1    2.1      2     1
## 1066          0         162         0    1.9      1     0
## 1067          2         173         0    0.0      1     0
## 1068          2         166         0    0.5      2     1
## 1069          2         150         1    1.9      2     1
## 1070          2         178         0    0.8      1     0
## 1071          2         145         0    4.2      3     0
## 1072          2         161         0    0.0      1     1
## 1073          0         179         0    0.0      1     0
## 1074          0         194         0    0.8      3     0
## 1075          0         120         1    0.0      2     1
## 1076          2         195         0    0.0      1     1
## 1077          2         146         0    2.0      2     1
## 1078          0         163         0    0.0      1     0
## 1079          0         122         1    4.2      2     1
## 1080          2         143         1    0.1      2     1
## 1081          0         106         0    1.9      2     1
## 1082          2         115         0    1.5      2     0
## 1083          2         125         1    0.9      2     1
```

```
## 1084              2           131           0     0.1        2      0
## 1085              2           152           1     0.2        2      0
## 1086              0           162           0     1.1        1      0
## 1087              2           125           0     0.0        1      1
## 1088              2           159           0     0.0        1      0
## 1089              0           154           1     0.0        1      0
## 1090              0           173           0     0.2        1      0
## 1091              0           133           0     0.2        1      0
## 1092              0           161           0     0.0        1      0
## 1093              2           147           1     0.0        2      1
## 1094              2           130           1     3.0        2      1
## 1095              2           126           1     0.9        2      1
## 1096              0           155           0     0.0        1      0
## 1097              0           154           1     1.4        2      1
## 1098              0           170           0     0.0        1      0
## 1099              0           182           1     3.8        2      1
## 1100              2           168           0     2.0        2      0
## 1101              0           165           1     1.0        2      1
## 1102              0           160           0     0.0        1      1
## 1103              2           162           0     1.9        2      0
## 1104              0           172           0     0.0        1      0
## 1105              2           152           1     0.0        2      0
## 1106              0           122           0     2.0        2      0
## 1107              2           182           0     0.0        1      0
## 1108              2           172           1     0.0        1      0
## 1109              2           167           0     0.0        1      0
## 1110              0           179           0     0.0        1      0
## 1111              0            95           1     2.0        2      1
## 1112              0           169           1     1.8        2      1
## 1113              0           192           0     0.7        1      0
## 1114              0           143           0     0.1        1      0
## 1115              0           172           0     0.0        1      0
## 1116              2           108           1     0.0        2      1
## 1117              2           132           1     0.1        1      1
## 1118              2           169           0     0.1        2      0
## 1119              1           117           1     3.4        2      1
## 1120              2           126           0     0.8        1      1
## 1121              2           121           1     0.2        1      0
## 1122              0           163           0     0.0        1      0
## 1123              2           116           1     3.2        2      1
## 1124              2           103           1     1.6        3      1
## 1125              2           144           0     0.8        1      1
## 1126              0           162           0     0.0        2      0
## 1127              0           162           0     0.0        1      0
## 1128              0           153           0     0.0        1      0
## 1129              0           163           0     0.0        1      0
## 1130              0           163           0     0.0        1      0
## 1131              0           145           0     2.6        2      1
## 1132              0            96           0     0.0        1      0
## 1133              0            71           0     1.0        2      1
```

```
## 1134            0           156           0     0.1         1        1
## 1135            2           118           1     1.0         2        1
## 1136            0           168           0     1.0         1        1
## 1137            2           140           0     0.0         1        0
## 1138            0           126           1     1.5         2        0
## 1139            0           105           0     2.0         2        1
## 1140            0           105           1     0.2         2        0
## 1141            2           157           0     0.6         1        0
## 1142            0           181           0     1.2         2        0
## 1143            0           173           0     0.0         2        0
## 1144            0           142           0     0.3         1        0
## 1145            1           116           0     1.1         2        0
## 1146            2           143           0     0.0         1        0
## 1147            0           141           0     0.3         1        1
## 1148            0           149           0     0.3         2        0
## 1149            2           152           0     0.0         1        1
## 1150            0           171           0     0.9         1        0
## 1151            0           169           0     0.0         1        0
## 1152            2           125           1     3.6         2        1
## 1153            0           125           1     1.8         2        1
## 1154            0           156           1     1.0         2        1
## 1155            0           134           0     2.2         2        1
## 1156            0           181           0     0.0         1        1
## 1157            0           150           0     0.0         1        0
## 1158            2           138           1     1.9         1        1
## 1159            2           138           0     2.3         1        0
## 1160            0           120           1     1.8         2        1
## 1161            0           125           0     1.6         2        0
## 1162            0           162           0     0.8         1        1
## 1163            2           155           0     0.6         2        0
## 1164            2           152           0     0.0         2        0
## 1165            0           152           0     0.0         2        0
## 1166            2           164           0     0.0         1        1
## 1167            0           131           0     0.6         2        0
## 1168            0           143           1     3.0         2        1
## 1169            0           179           0     0.0         1        0
## 1170            1           130           1     2.0         2        1
## 1171            0           174           0     0.0         1        0
## 1172            0           161           0     0.0         1        1
## 1173            1           140           0     4.4         3        1
## 1174            2           146           1     2.8         2        1
## 1175            0           144           0     0.4         2        0
## 1176            2           163           0     0.0         1        0
## 1177            0           169           0     0.0         3        0
## 1178            2           150           0     0.8         2        1
## 1179            0           166           0     1.2         1        0
## 1180            0           144           1     2.8         3        1
## 1181            2           144           1     4.0         1        1
## 1182            0           136           1     0.0         2        1
## 1183            0           182           0     0.0         1        0
```

```
## 1184           2            90               0    1.0        2      1
## 1185           0           123               1    0.2        2      1
## 1186           0           132               0    1.2        2      1
## 1187           0           141               0    3.4        2      1
## 1188           0           115               1    1.2        2      1
## 1189           2           174               0    0.0        2      1
## 1190           0           173               0    0.0        1      0
```

```
heart_clean[heart_clean$cholesterol >= min(heart_chol_boxplot$out), ]
```

```
##      age sex chest.pain.type resting.bp.s cholesterol fasting.blood.sugar
## 1     40   1               2          140         289                   0
## 2     49   0               3          160         180                   0
## 3     37   1               2          130         283                   0
## 4     48   0               4          138         214                   0
## 5     54   1               3          150         195                   0
## 6     39   1               3          120         339                   0
## 7     45   0               2          130         237                   0
## 8     54   1               2          110         208                   0
## 9     37   1               4          140         207                   0
## 10    48   0               2          120         284                   0
## 11    37   0               3          130         211                   0
## 12    58   1               2          136         164                   0
## 13    39   1               2          120         204                   0
## 14    49   1               4          140         234                   0
## 15    42   0               3          115         211                   0
## 16    54   0               2          120         273                   0
## 17    38   1               4          110         196                   0
## 18    43   0               2          120         201                   0
## 19    60   1               4          100         248                   0
## 20    36   1               2          120         267                   0
## 21    43   0               1          100         223                   0
## 22    44   1               2          120         184                   0
## 23    49   0               2          124         201                   0
## 24    44   1               2          150         288                   0
## 25    40   1               3          130         215                   0
## 26    36   1               3          130         209                   0
## 27    53   1               4          124         260                   0
## 28    52   1               2          120         284                   0
## 29    53   0               2          113         468                   0
## 30    51   1               2          125         188                   0
## 31    53   1               3          145         518                   0
## 32    56   1               3          130         167                   0
## 33    54   1               4          125         224                   0
## 34    41   1               4          130         172                   0
## 35    43   0               2          150         186                   0
## 36    32   1               2          125         254                   0
## 37    65   1               4          140         306                   1
## 38    41   0               2          110         250                   0
## 39    48   0               2          120         177                   1
```

```
## 40    48   0                4           150          227                   0
## 41    54   0                2           150          230                   0
## 42    54   0                3           130          294                   0
## 43    35   1                2           150          264                   0
## 44    52   1                3           140          259                   0
## 45    43   1                4           120          175                   0
## 46    59   1                3           130          318                   0
## 47    37   1                4           120          223                   0
## 48    50   1                2           140          216                   0
## 49    36   1                3           112          340                   0
## 50    41   1                4           110          289                   0
## 51    50   1                4           130          233                   0
## 52    47   0                4           120          205                   0
## 53    45   1                2           140          224                   1
## 54    41   0                2           130          245                   0
## 55    52   0                4           130          180                   0
## 56    51   0                2           160          194                   0
## 57    31   1                4           120          270                   0
## 58    58   1                3           130          213                   0
## 59    54   1                4           150          365                   0
## 60    52   1                4           112          342                   0
## 61    49   1                2           100          253                   0
## 62    43   0                3           150          254                   0
## 63    45   1                4           140          224                   0
## 64    46   1                4           120          277                   0
## 65    50   0                2           110          202                   0
## 66    37   0                2           120          260                   0
## 67    45   0                4           132          297                   0
## 68    32   1                2           110          225                   0
## 69    52   1                4           160          246                   0
## 70    44   1                4           150          412                   0
## 71    57   1                2           140          265                   0
## 72    44   1                2           130          215                   0
## 73    52   1                4           120          182                   0
## 74    44   0                4           120          218                   0
## 75    55   1                4           140          268                   0
## 76    46   1                3           150          163                   0
## 77    32   1                4           118          529                   0
## 78    35   0                4           140          167                   0
## 79    52   1                2           140          100                   0
## 80    49   1                4           130          206                   0
## 81    55   1                3           110          277                   0
## 82    54   1                2           120          238                   0
## 83    63   1                4           150          223                   0
## 84    52   1                2           160          196                   0
## 85    56   1                4           150          213                   1
## 86    66   1                4           140          139                   0
## 87    65   1                4           170          263                   1
## 88    53   0                2           140          216                   0
## 89    43   1                1           120          291                   0
```

```
## 90     55   1                4           140          229                   0
## 91     49   0                2           110          208                   0
## 92     39   1                4           130          307                   0
## 93     52   0                2           120          210                   0
## 94     48   1                4           160          329                   0
## 95     39   0                3           110          182                   0
## 96     58   1                4           130          263                   0
## 97     43   1                2           142          207                   0
## 98     39   1                3           160          147                   1
## 99     56   1                4           120           85                   0
## 100    41   1                2           125          269                   0
## 101    65   1                4           130          275                   0
## 102    51   1                4           130          179                   0
## 103    40   0                4           150          392                   0
## 104    40   1                4           120          466                   1
## 105    46   1                4           118          186                   0
## 106    57   1                2           140          260                   1
## 107    48   0                4           120          254                   0
## 108    34   1                2           150          214                   0
## 109    50   1                4           140          129                   0
## 110    39   1                2           190          241                   0
## 111    59   0                2           130          188                   0
## 112    57   1                4           150          255                   0
## 113    47   1                4           140          276                   1
## 114    38   1                2           140          297                   0
## 115    49   0                3           130          207                   0
## 116    33   0                4           100          246                   0
## 117    38   1                4           120          282                   0
## 118    59   0                4           130          338                   1
## 119    35   0                1           120          160                   0
## 120    34   1                1           140          156                   0
## 121    47   0                3           135          248                   1
## 122    52   0                3           125          272                   0
## 123    46   1                4           110          240                   0
## 124    58   0                2           180          393                   0
## 125    58   1                2           130          230                   0
## 126    54   1                2           120          246                   0
## 127    34   0                2           130          161                   0
## 128    48   0                4           108          163                   0
## 129    54   0                2           120          230                   1
## 130    42   1                3           120          228                   0
## 131    38   1                3           145          292                   0
## 132    46   1                4           110          202                   0
## 133    56   1                4           170          388                   0
## 134    56   1                4           150          230                   0
## 135    61   0                4           130          294                   0
## 136    49   1                3           115          265                   0
## 137    43   0                2           120          215                   0
## 138    39   1                2           120          241                   0
## 139    54   1                4           140          166                   0
```

```
## 140   43   1                 4           150           247                     0
## 141   52   1                 4           160           331                     0
## 142   50   1                 4           140           341                     0
## 143   47   1                 4           160           291                     0
## 144   53   1                 4           140           243                     0
## 145   56   0                 2           120           279                     0
## 146   39   1                 4           110           273                     0
## 147   42   1                 2           120           198                     0
## 148   43   0                 2           120           249                     0
## 149   50   1                 2           120           168                     0
## 150   54   1                 4           130           603                     1
## 151   39   1                 2           130           215                     0
## 152   48   1                 2           100           159                     0
## 153   40   1                 2           130           275                     0
## 154   55   1                 4           120           270                     0
## 155   41   1                 2           120           291                     0
## 156   56   1                 4           155           342                     1
## 157   38   1                 4           110           190                     0
## 158   49   1                 4           140           185                     0
## 159   44   1                 4           130           290                     0
## 160   54   1                 2           160           195                     0
## 161   59   1                 4           140           264                     1
## 162   49   1                 4           128           212                     0
## 163   47   1                 2           160           263                     0
## 164   49   0                 2           110           208                     0
## 165   42   1                 2           120           196                     0
## 166   52   0                 2           140           225                     0
## 167   46   1                 1           140           272                     1
## 168   50   1                 4           140           231                     0
## 169   48   1                 2           140           238                     0
## 170   58   1                 4           135           222                     0
## 171   58   1                 3           140           179                     0
## 172   29   1                 2           120           243                     0
## 173   40   1                 3           140           235                     0
## 174   53   1                 2           140           320                     0
## 175   49   1                 3           140           187                     0
## 176   52   1                 4           140           266                     0
## 177   43   1                 4           140           288                     0
## 178   54   1                 4           140           216                     0
## 179   59   1                 2           140           287                     0
## 180   37   1                 3           130           194                     0
## 181   46   0                 4           130           238                     0
## 182   52   1                 4           130           225                     0
## 183   51   1                 2           130           224                     0
## 184   52   1                 4           140           404                     0
## 185   46   1                 4           110           238                     0
## 186   54   0                 2           160           312                     0
## 187   58   1                 3           160           211                     1
## 188   58   1                 2           130           251                     0
## 189   41   1                 4           120           237                     1
```

```
## 190   50   0              4          120         328                0
## 191   53   1              4          180         285                0
## 192   46   1              4          180         280                0
## 193   50   1              2          170         209                0
## 194   48   1              2          130         245                0
## 195   45   1              3          135         192                0
## 196   41   0              2          125         184                0
## 197   62   0              1          160         193                0
## 198   49   1              4          120         297                0
## 199   42   1              2          150         268                0
## 200   53   1              4          120         246                0
## 201   57   0              1          130         308                0
## 202   47   1              1          110         249                0
## 203   46   1              3          120         230                0
## 204   42   1              3          160         147                0
## 205   31   0              2          100         219                0
## 206   56   1              2          130         184                0
## 207   50   1              4          150         215                0
## 208   35   1              2          120         308                0
## 209   35   1              2          110         257                0
## 210   28   1              2          130         132                0
## 211   54   1              4          125         216                0
## 212   48   1              4          106         263                1
## 213   50   0              3          140         288                0
## 214   56   1              3          130         276                0
## 215   56   0              3          130         219                0
## 216   47   1              4          150         226                0
## 217   30   0              1          170         237                0
## 218   39   1              4          110         280                0
## 219   54   1              3          120         217                0
## 220   55   1              2          140         196                0
## 221   29   1              2          140         263                0
## 222   46   1              4          130         222                0
## 223   51   0              4          160         303                0
## 224   48   0              3          120         195                0
## 225   33   1              3          120         298                0
## 226   55   1              2          120         256                1
## 227   50   1              4          145         264                0
## 228   53   1              3          120         195                0
## 229   38   1              4           92         117                0
## 230   41   1              2          120         295                0
## 231   37   0              4          130         173                0
## 232   37   1              4          130         315                0
## 233   40   1              3          130         281                0
## 234   38   0              2          120         275                0
## 235   41   1              4          112         250                0
## 236   54   0              2          140         309                0
## 237   39   1              2          120         200                0
## 238   41   1              4          120         336                0
## 239   55   1              1          140         295                0
```

```
## 240   48   1             4         160         355                  0
## 241   48   1             4         160         193                  0
## 242   55   1             2         145         326                  0
## 243   54   1             4         200         198                  0
## 244   55   1             2         160         292                  1
## 245   43   0             2         120         266                  0
## 246   48   1             4         160         268                  0
## 247   54   1             1         120         171                  0
## 248   54   1             3         120         237                  0
## 249   48   1             4         122         275                  1
## 250   45   1             4         130         219                  0
## 251   49   1             4         130         341                  0
## 252   44   1             4         135         491                  0
## 253   48   1             4         120         260                  0
## 254   61   1             4         125         292                  0
## 255   62   1             2         140         271                  0
## 256   55   1             4         145         248                  0
## 257   53   0             3         120         274                  0
## 258   55   0             2         130         394                  0
## 259   36   1             3         150         160                  0
## 260   51   0             3         150         200                  0
## 261   55   0             2         122         320                  0
## 262   46   1             2         140         275                  0
## 263   54   0             2         120         221                  0
## 264   46   1             4         120         231                  0
## 265   59   1             4         130         126                  0
## 266   47   1             3         140         193                  0
## 267   54   1             2         160         305                  0
## 268   52   1             4         130         298                  0
## 269   34   1             2          98         220                  0
## 270   54   1             4         130         242                  0
## 271   47   0             3         130         235                  0
## 272   45   1             4         120         225                  0
## 273   32   0             2         105         198                  0
## 274   55   1             4         140         201                  0
## 275   55   1             3         120         220                  0
## 276   45   0             2         180         295                  0
## 277   59   1             3         180         213                  0
## 278   51   1             3         135         160                  0
## 279   52   1             4         170         223                  0
## 280   57   0             4         180         347                  0
## 281   54   0             2         130         253                  0
## 282   60   1             3         120         246                  0
## 283   49   1             4         150         222                  0
## 284   51   0             3         130         220                  0
## 285   55   0             2         110         344                  0
## 286   42   1             4         140         358                  0
## 287   51   0             3         110         190                  0
## 288   59   1             4         140         169                  0
## 289   53   1             2         120         181                  0
```

```
## 290   48   0                2           133          308                    0
## 291   36   1                2           120          166                    0
## 292   48   1                3           110          211                    0
## 293   47   0                2           140          257                    0
## 294   53   1                4           130          182                    0
## 418   63   1                4           140          260                    0
## 419   44   1                4           130          209                    0
## 420   60   1                4           132          218                    0
## 421   55   1                4           142          228                    0
## 422   66   1                3           110          213                    1
## 424   65   1                4           150          236                    1
## 427   60   1                2           160          267                    1
## 428   56   1                2           126          166                    0
## 433   62   1                4           120          220                    0
## 434   63   1                4           170          177                    0
## 435   46   1                4           110          236                    0
## 445   60   1                4           130          186                    1
## 446   56   1                4           120          100                    0
## 447   55   1                3           136          228                    0
## 449   77   1                4           124          171                    0
## 450   63   1                4           160          230                    1
## 454   60   1                4           140          281                    0
## 456   58   1                4           136          203                    1
## 462   57   1                4           139          277                    1
## 464   59   1                4           122          233                    0
## 467   42   1                3           134          240                    0
## 470   62   1                4           152          153                    0
## 471   56   1                2           124          224                    1
## 475   60   1                3           141          316                    1
## 478   51   1                4           132          218                    1
## 480   57   1                4           130          311                    1
## 484   67   1                1           142          270                    1
## 487   63   1                2           139          217                    1
## 488   55   1                2           110          214                    1
## 489   57   1                4           140          214                    0
## 490   65   1                1           140          252                    0
## 491   54   1                4           136          220                    0
## 492   72   1                3           120          214                    0
## 493   75   1                4           170          203                    1
## 495   51   1                3           137          339                    0
## 496   60   1                4           142          216                    0
## 497   64   0                4           142          276                    0
## 498   58   1                4           132          458                    1
## 499   61   1                4           146          241                    0
## 500   67   1                4           160          384                    1
## 501   62   1                4           135          297                    0
## 502   65   1                4           136          248                    0
## 503   63   1                4           130          308                    0
## 504   69   1                4           140          208                    0
## 505   51   1                4           132          227                    1
```

```
## 506   62   1              4          158         210                   1
## 507   55   1              3          136         245                   1
## 508   75   1              4          136         225                   0
## 509   40   1              3          106         240                   0
## 511   58   1              4          110         198                   0
## 512   60   1              4          136         195                   0
## 513   63   1              4          160         267                   1
## 514   35   1              3          123         161                   0
## 515   62   1              1          112         258                   0
## 518   68   1              3          150         195                   1
## 519   65   1              4          150         235                   0
## 521   63   1              4           96         305                   0
## 522   64   1              4          130         223                   0
## 523   61   1              4          120         282                   0
## 524   50   1              4          144         349                   0
## 525   59   1              4          124         160                   0
## 526   55   1              4          150         160                   0
## 527   45   1              3          130         236                   0
## 528   65   1              4          144         312                   0
## 529   61   1              2          139         283                   0
## 530   49   1              3          131         142                   0
## 531   72   1              4          143         211                   0
## 532   50   1              4          133         218                   0
## 533   64   1              4          143         306                   1
## 534   55   1              4          116         186                   1
## 535   63   1              4          110         252                   0
## 536   59   1              4          125         222                   0
## 539   74   1              4          150         258                   1
## 540   54   1              4          130         202                   1
## 541   57   1              4          110         197                   0
## 542   62   1              3          138         204                   0
## 543   76   1              3          104         113                   0
## 544   54   0              4          138         274                   0
## 545   70   1              4          170         192                   0
## 546   61   0              2          140         298                   1
## 547   48   1              4          132         272                   0
## 548   48   1              3          132         220                   1
## 549   61   1              1          142         200                   1
## 550   66   1              4          112         261                   0
## 551   68   1              1          139         181                   1
## 552   55   1              4          172         260                   0
## 553   62   1              3          120         220                   0
## 554   71   1              3          144         221                   0
## 555   74   1              1          145         216                   1
## 556   53   1              3          155         175                   1
## 557   58   1              3          150         219                   0
## 558   75   1              4          160         310                   1
## 559   56   1              3          137         208                   1
## 560   58   1              3          137         232                   0
## 561   64   1              4          134         273                   0
```

```
## 562   54   1               3           133          203                  0
## 563   54   1               2           132          182                  0
## 564   59   1               4           140          274                  0
## 565   55   1               4           135          204                  1
## 566   57   1               4           144          270                  1
## 567   61   1               4           141          292                  0
## 568   41   1               4           150          171                  0
## 569   71   1               4           130          221                  0
## 570   38   1               4           110          289                  0
## 571   55   1               4           158          217                  0
## 572   56   1               4           128          223                  0
## 573   69   1               4           140          110                  1
## 574   64   1               4           150          193                  0
## 575   72   1               4           160          123                  1
## 576   69   1               4           142          210                  1
## 577   56   1               4           137          282                  1
## 578   62   1               4           139          170                  0
## 579   67   1               4           146          369                  0
## 580   57   1               4           156          173                  0
## 581   69   1               4           145          289                  1
## 582   51   1               4           131          152                  1
## 583   48   1               4           140          208                  0
## 584   69   1               4           122          216                  1
## 585   69   1               3           142          271                  0
## 586   64   1               4           141          244                  1
## 587   57   1               2           180          285                  1
## 588   53   1               4           124          243                  0
## 589   37   1               3           118          240                  0
## 590   67   1               4           140          219                  0
## 591   74   1               3           140          237                  1
## 592   63   1               2           136          165                  0
## 593   58   1               4           100          213                  0
## 594   61   1               4           190          287                  1
## 595   64   1               4           130          258                  1
## 596   58   1               4           160          256                  1
## 597   60   1               4           130          186                  1
## 598   57   1               4           122          264                  0
## 599   55   1               3           133          185                  0
## 600   55   1               4           120          226                  0
## 601   56   1               4           130          203                  1
## 602   57   1               4           130          207                  0
## 603   61   1               3           140          284                  0
## 604   61   1               3           120          337                  0
## 605   58   1               3           150          219                  0
## 606   74   1               4           155          310                  0
## 607   68   1               3           134          254                  1
## 608   51   0               4           114          258                  1
## 609   62   1               4           160          254                  1
## 610   53   1               4           144          300                  1
## 611   62   1               4           158          170                  0
```

```
## 612   46   1                4           134         310                 0
## 613   54   0                4           127         333                 1
## 614   62   1                1           135         139                 0
## 615   55   1                4           122         223                 1
## 616   58   1                4           140         385                 1
## 617   62   1                2           120         254                 0
## 618   70   1                4           130         322                 0
## 619   67   0                3           115         564                 0
## 620   57   1                2           124         261                 0
## 621   64   1                4           128         263                 0
## 622   74   0                2           120         269                 0
## 623   65   1                4           120         177                 0
## 624   56   1                3           130         256                 1
## 625   59   1                4           110         239                 0
## 626   60   1                4           140         293                 0
## 627   63   0                4           150         407                 0
## 628   59   1                4           135         234                 0
## 629   53   1                4           142         226                 0
## 630   44   1                3           140         235                 0
## 631   61   1                1           134         234                 0
## 632   57   0                4           128         303                 0
## 633   71   0                4           112         149                 0
## 634   46   1                4           140         311                 0
## 635   53   1                4           140         203                 1
## 636   64   1                1           110         211                 0
## 637   40   1                1           140         199                 0
## 638   67   1                4           120         229                 0
## 639   48   1                2           130         245                 0
## 640   43   1                4           115         303                 0
## 641   47   1                4           112         204                 0
## 642   54   0                2           132         288                 1
## 643   48   0                3           130         275                 0
## 644   46   0                4           138         243                 0
## 645   51   0                3           120         295                 0
## 646   58   1                3           112         230                 0
## 647   71   0                3           110         265                 1
## 648   57   1                3           128         229                 0
## 649   66   1                4           160         228                 0
## 650   37   0                3           120         215                 0
## 651   59   1                4           170         326                 0
## 652   50   1                4           144         200                 0
## 653   48   1                4           130         256                 1
## 654   61   1                4           140         207                 0
## 655   59   1                1           160         273                 0
## 656   42   1                3           130         180                 0
## 657   48   1                4           122         222                 0
## 658   40   1                4           152         223                 0
## 659   62   0                4           124         209                 0
## 660   44   1                3           130         233                 0
## 661   46   1                2           101         197                 1
```

```
## 662   59   1                   3            126          218                        1
## 663   58   1                   3            140          211                        1
## 664   49   1                   3            118          149                        0
## 665   44   1                   4            110          197                        0
## 666   66   1                   2            160          246                        0
## 667   65   0                   4            150          225                        0
## 668   42   1                   4            136          315                        0
## 669   52   1                   2            128          205                        1
## 670   65   0                   3            140          417                        1
## 671   63   0                   2            140          195                        0
## 672   45   0                   2            130          234                        0
## 673   41   0                   2            105          198                        0
## 674   61   1                   4            138          166                        0
## 675   60   0                   3            120          178                        1
## 676   59   0                   4            174          249                        0
## 677   62   1                   2            120          281                        0
## 678   57   1                   3            150          126                        1
## 679   51   0                   4            130          305                        0
## 680   44   1                   3            120          226                        0
## 681   60   0                   1            150          240                        0
## 682   63   1                   1            145          233                        1
## 683   57   1                   4            150          276                        0
## 684   51   1                   4            140          261                        0
## 685   58   0                   2            136          319                        1
## 686   44   0                   3            118          242                        0
## 687   47   1                   3            108          243                        0
## 688   61   1                   4            120          260                        0
## 689   57   0                   4            120          354                        0
## 690   70   1                   2            156          245                        0
## 691   76   0                   3            140          197                        0
## 692   67   0                   4            106          223                        0
## 693   45   1                   4            142          309                        0
## 694   45   1                   4            104          208                        0
## 695   39   0                   3             94          199                        0
## 696   42   0                   3            120          209                        0
## 697   56   1                   2            120          236                        0
## 698   58   1                   4            146          218                        0
## 699   35   1                   4            120          198                        0
## 700   58   1                   4            150          270                        0
## 701   41   1                   3            130          214                        0
## 702   57   1                   4            110          201                        0
## 703   42   1                   1            148          244                        0
## 704   62   1                   2            128          208                        1
## 705   59   1                   1            178          270                        0
## 706   41   0                   2            126          306                        0
## 707   50   1                   4            150          243                        0
## 708   59   1                   2            140          221                        0
## 709   61   0                   4            130          330                        0
## 710   54   1                   4            124          266                        0
## 711   54   1                   4            110          206                        0
```

```
## 712   52  1              4          125         212                0
## 713   47  1              4          110         275                0
## 714   66  1              4          120         302                0
## 715   58  1              4          100         234                0
## 716   64  0              3          140         313                0
## 717   50  0              2          120         244                0
## 718   44  0              3          108         141                0
## 719   67  1              4          120         237                0
## 720   49  0              4          130         269                0
## 721   57  1              4          165         289                1
## 722   63  1              4          130         254                0
## 723   48  1              4          124         274                0
## 724   51  1              3          100         222                0
## 725   60  0              4          150         258                0
## 726   59  1              4          140         177                0
## 727   45  0              2          112         160                0
## 728   55  0              4          180         327                0
## 729   41  1              2          110         235                0
## 730   60  0              4          158         305                0
## 731   54  0              3          135         304                1
## 732   42  1              2          120         295                0
## 733   49  0              2          134         271                0
## 734   46  1              4          120         249                0
## 735   56  0              4          200         288                1
## 736   66  0              1          150         226                0
## 737   56  1              4          130         283                1
## 738   49  1              3          120         188                0
## 739   54  1              4          122         286                0
## 740   57  1              4          152         274                0
## 741   65  0              3          160         360                0
## 742   54  1              3          125         273                0
## 743   54  0              3          160         201                0
## 744   62  1              4          120         267                0
## 745   52  0              3          136         196                0
## 746   52  1              2          134         201                0
## 747   60  1              4          117         230                1
## 748   63  0              4          108         269                0
## 749   66  1              4          112         212                0
## 750   42  1              4          140         226                0
## 751   64  1              4          120         246                0
## 752   54  1              3          150         232                0
## 753   46  0              3          142         177                0
## 754   67  0              3          152         277                0
## 755   56  1              4          125         249                1
## 756   34  0              2          118         210                0
## 757   57  1              4          132         207                0
## 758   64  1              4          145         212                0
## 759   59  1              4          138         271                0
## 760   50  1              3          140         233                0
## 761   51  1              1          125         213                0
```

```
## 762   54   1                 2           192          283                   0
## 763   53   1                 4           123          282                   0
## 764   52   1                 4           112          230                   0
## 765   40   1                 4           110          167                   0
## 766   58   1                 3           132          224                   0
## 767   41   0                 3           112          268                   0
## 768   41   1                 3           112          250                   0
## 769   50   0                 3           120          219                   0
## 770   54   0                 3           108          267                   0
## 771   64   0                 4           130          303                   0
## 772   51   0                 3           130          256                   0
## 773   46   0                 2           105          204                   0
## 774   55   1                 4           140          217                   0
## 775   45   1                 2           128          308                   0
## 776   56   1                 1           120          193                   0
## 777   66   0                 4           178          228                   1
## 778   38   1                 1           120          231                   0
## 779   62   0                 4           150          244                   0
## 780   55   1                 2           130          262                   0
## 781   58   1                 4           128          259                   0
## 782   43   1                 4           110          211                   0
## 783   64   0                 4           180          325                   0
## 784   50   0                 4           110          254                   0
## 785   53   1                 3           130          197                   1
## 786   45   0                 4           138          236                   0
## 787   65   1                 1           138          282                   1
## 788   69   1                 1           160          234                   1
## 789   69   1                 3           140          254                   0
## 790   67   1                 4           100          299                   0
## 791   68   0                 3           120          211                   0
## 792   34   1                 1           118          182                   0
## 793   62   0                 4           138          294                   1
## 794   51   1                 4           140          298                   0
## 795   46   1                 3           150          231                   0
## 796   67   1                 4           125          254                   1
## 797   50   1                 3           129          196                   0
## 798   42   1                 3           120          240                   1
## 799   56   0                 4           134          409                   0
## 800   41   1                 4           110          172                   0
## 801   42   0                 4           102          265                   0
## 802   53   1                 3           130          246                   1
## 803   43   1                 3           130          315                   0
## 804   56   1                 4           132          184                   0
## 805   52   1                 4           108          233                   1
## 806   62   0                 4           140          394                   0
## 807   70   1                 3           160          269                   0
## 808   54   1                 4           140          239                   0
## 809   70   1                 4           145          174                   0
## 810   54   1                 2           108          309                   0
## 811   35   1                 4           126          282                   0
```

```
## 812   48   1                3            124            255                    1
## 813   55   0                2            135            250                    0
## 814   58   0                4            100            248                    0
## 815   54   0                3            110            214                    0
## 816   69   0                1            140            239                    0
## 817   77   1                4            125            304                    0
## 818   68   1                3            118            277                    0
## 819   58   1                4            125            300                    0
## 820   60   1                4            125            258                    0
## 821   51   1                4            140            299                    0
## 822   55   1                4            160            289                    0
## 823   52   1                1            152            298                    1
## 824   60   0                3            102            318                    0
## 825   58   1                3            105            240                    0
## 826   64   1                3            125            309                    0
## 827   37   1                3            130            250                    0
## 828   59   1                1            170            288                    0
## 829   51   1                3            125            245                    1
## 830   43   0                3            122            213                    0
## 831   58   1                4            128            216                    0
## 832   29   1                2            130            204                    0
## 833   41   0                2            130            204                    0
## 834   63   0                3            135            252                    0
## 835   51   1                3             94            227                    0
## 836   54   1                3            120            258                    0
## 837   44   1                2            120            220                    0
## 838   54   1                4            110            239                    0
## 839   65   1                4            135            254                    0
## 840   57   1                3            150            168                    0
## 841   63   1                4            130            330                    1
## 842   35   0                4            138            183                    0
## 843   41   1                2            135            203                    0
## 844   62   0                3            130            263                    0
## 845   43   0                4            132            341                    1
## 846   58   0                1            150            283                    1
## 847   52   1                1            118            186                    0
## 848   61   0                4            145            307                    0
## 849   39   1                4            118            219                    0
## 850   45   1                4            115            260                    0
## 851   52   1                4            128            255                    0
## 852   62   1                3            130            231                    0
## 853   62   0                4            160            164                    0
## 854   53   0                4            138            234                    0
## 855   43   1                4            120            177                    0
## 856   47   1                3            138            257                    0
## 857   52   1                2            120            325                    0
## 858   68   1                3            180            274                    1
## 859   39   1                3            140            321                    0
## 860   53   0                4            130            264                    0
## 861   62   0                4            140            268                    0
```

```
## 862   51   0                3          140          308                 0
## 863   60   1                4          130          253                 0
## 864   65   1                4          110          248                 0
## 865   65   0                3          155          269                 0
## 866   60   1                3          140          185                 0
## 867   60   1                4          145          282                 0
## 868   54   1                4          120          188                 0
## 869   44   1                2          130          219                 0
## 870   44   1                4          112          290                 0
## 871   51   1                3          110          175                 0
## 872   59   1                3          150          212                 1
## 873   71   0                2          160          302                 0
## 874   61   1                3          150          243                 1
## 875   55   1                4          132          353                 0
## 876   64   1                3          140          335                 0
## 877   43   1                4          150          247                 0
## 878   58   0                3          120          340                 0
## 879   60   1                4          130          206                 0
## 880   58   1                2          120          284                 0
## 881   49   1                2          130          266                 0
## 882   48   1                2          110          229                 0
## 883   52   1                3          172          199                 1
## 884   44   1                2          120          263                 0
## 885   56   0                2          140          294                 0
## 886   57   1                4          140          192                 0
## 887   67   1                4          160          286                 0
## 888   63   1                1          145          233                 1
## 889   67   1                4          160          286                 0
## 890   67   1                4          120          229                 0
## 891   37   1                3          130          250                 0
## 892   41   0                2          130          204                 0
## 893   56   1                2          120          236                 0
## 894   62   0                4          140          268                 0
## 895   57   0                4          120          354                 0
## 896   63   1                4          130          254                 0
## 897   53   1                4          140          203                 1
## 898   57   1                4          140          192                 0
## 899   56   0                2          140          294                 0
## 900   56   1                3          130          256                 1
## 901   44   1                2          120          263                 0
## 902   52   1                3          172          199                 1
## 903   57   1                3          150          168                 0
## 904   48   1                2          110          229                 0
## 905   54   1                4          140          239                 0
## 906   48   0                3          130          275                 0
## 907   49   1                2          130          266                 0
## 908   64   1                1          110          211                 0
## 909   58   0                1          150          283                 1
## 910   58   1                2          120          284                 0
## 911   58   1                3          132          224                 0
```

```
## 912   60   1            4           130          206                 0
## 913   50   0            3           120          219                 0
## 914   58   0            3           120          340                 0
## 915   66   0            1           150          226                 0
## 916   43   1            4           150          247                 0
## 917   40   1            4           110          167                 0
## 918   69   0            1           140          239                 0
## 919   60   1            4           117          230                 1
## 920   64   1            3           140          335                 0
## 921   59   1            4           135          234                 0
## 922   44   1            3           130          233                 0
## 923   42   1            4           140          226                 0
## 924   43   1            4           120          177                 0
## 925   57   1            4           150          276                 0
## 926   55   1            4           132          353                 0
## 927   61   1            3           150          243                 1
## 928   65   0            4           150          225                 0
## 929   40   1            1           140          199                 0
## 930   71   0            2           160          302                 0
## 931   59   1            3           150          212                 1
## 932   61   0            4           130          330                 0
## 933   58   1            3           112          230                 0
## 934   51   1            3           110          175                 0
## 935   50   1            4           150          243                 0
## 936   65   0            3           140          417                 1
## 937   53   1            3           130          197                 1
## 938   41   0            2           105          198                 0
## 939   65   1            4           120          177                 0
## 940   44   1            4           112          290                 0
## 941   44   1            2           130          219                 0
## 942   60   1            4           130          253                 0
## 943   54   1            4           124          266                 0
## 944   50   1            3           140          233                 0
## 945   41   1            4           110          172                 0
## 946   54   1            3           125          273                 0
## 947   51   1            1           125          213                 0
## 948   51   0            4           130          305                 0
## 949   46   0            3           142          177                 0
## 950   58   1            4           128          216                 0
## 951   54   0            3           135          304                 1
## 952   54   1            4           120          188                 0
## 953   60   1            4           145          282                 0
## 954   60   1            3           140          185                 0
## 955   54   1            3           150          232                 0
## 956   59   1            4           170          326                 0
## 957   46   1            3           150          231                 0
## 958   65   0            3           155          269                 0
## 959   67   1            4           125          254                 1
## 960   62   1            4           120          267                 0
## 961   65   1            4           110          248                 0
```

```
## 962   44  1                4           110          197                     0
## 963   65  0                3           160          360                     0
## 964   60  1                4           125          258                     0
## 965   51  0                3           140          308                     0
## 966   48  1                2           130          245                     0
## 967   58  1                4           150          270                     0
## 968   45  1                4           104          208                     0
## 969   53  0                4           130          264                     0
## 970   39  1                3           140          321                     0
## 971   68  1                3           180          274                     1
## 972   52  1                2           120          325                     0
## 973   44  1                3           140          235                     0
## 974   47  1                3           138          257                     0
## 975   53  0                3           128          216                     0
## 976   53  0                4           138          234                     0
## 977   51  0                3           130          256                     0
## 978   66  1                4           120          302                     0
## 979   62  0                4           160          164                     0
## 980   62  1                3           130          231                     0
## 981   44  0                3           108          141                     0
## 982   63  0                3           135          252                     0
## 983   52  1                4           128          255                     0
## 984   59  1                4           110          239                     0
## 985   60  0                4           150          258                     0
## 986   52  1                2           134          201                     0
## 987   48  1                4           122          222                     0
## 988   45  1                4           115          260                     0
## 989   34  1                1           118          182                     0
## 990   57  0                4           128          303                     0
## 991   71  0                3           110          265                     1
## 992   49  1                3           120          188                     0
## 993   54  1                2           108          309                     0
## 994   59  1                4           140          177                     0
## 995   57  1                3           128          229                     0
## 996   61  1                4           120          260                     0
## 997   39  1                4           118          219                     0
## 998   61  0                4           145          307                     0
## 999   56  1                4           125          249                     1
## 1000  52  1                1           118          186                     0
## 1001  43  0                4           132          341                     1
## 1002  62  0                3           130          263                     0
## 1003  41  1                2           135          203                     0
## 1004  58  1                3           140          211                     1
## 1005  35  0                4           138          183                     0
## 1006  63  1                4           130          330                     1
## 1007  65  1                4           135          254                     0
## 1008  48  1                4           130          256                     1
## 1009  63  0                4           150          407                     0
## 1010  51  1                3           100          222                     0
## 1011  55  1                4           140          217                     0
```

```
## 1012  65   1                1           138           282                   1
## 1013  45   0                2           130           234                   0
## 1014  56   0                4           200           288                   1
## 1015  54   1                4           110           239                   0
## 1016  44   1                2           120           220                   0
## 1017  62   0                4           124           209                   0
## 1018  54   1                3           120           258                   0
## 1019  51   1                3            94           227                   0
## 1020  29   1                2           130           204                   0
## 1021  51   1                4           140           261                   0
## 1022  43   0                3           122           213                   0
## 1023  55   0                2           135           250                   0
## 1024  70   1                4           145           174                   0
## 1025  62   1                2           120           281                   0
## 1026  35   1                4           120           198                   0
## 1027  51   1                3           125           245                   1
## 1028  59   1                2           140           221                   0
## 1029  59   1                1           170           288                   0
## 1030  52   1                2           128           205                   1
## 1031  64   1                3           125           309                   0
## 1032  58   1                3           105           240                   0
## 1033  47   1                3           108           243                   0
## 1034  57   1                4           165           289                   1
## 1035  41   1                3           112           250                   0
## 1036  45   1                2           128           308                   0
## 1037  60   0                3           102           318                   0
## 1038  52   1                1           152           298                   1
## 1039  42   0                4           102           265                   0
## 1040  67   0                3           115           564                   0
## 1041  55   1                4           160           289                   0
## 1042  64   1                4           120           246                   0
## 1043  70   1                4           130           322                   0
## 1044  51   1                4           140           299                   0
## 1045  58   1                4           125           300                   0
## 1046  60   1                4           140           293                   0
## 1047  68   1                3           118           277                   0
## 1048  46   1                2           101           197                   1
## 1049  77   1                4           125           304                   0
## 1050  54   0                3           110           214                   0
## 1051  58   0                4           100           248                   0
## 1052  48   1                3           124           255                   1
## 1053  57   1                4           132           207                   0
## 1054  52   1                3           138           223                   0
## 1055  54   0                2           132           288                   1
## 1056  35   1                4           126           282                   0
## 1057  45   0                2           112           160                   0
## 1058  70   1                3           160           269                   0
## 1059  53   1                4           142           226                   0
## 1060  59   0                4           174           249                   0
## 1061  62   0                4           140           394                   0
```

```
## 1062  64   1                4           145           212                   0
## 1063  57   1                4           152           274                   0
## 1064  52   1                4           108           233                   1
## 1065  56   1                4           132           184                   0
## 1066  43   1                3           130           315                   0
## 1067  53   1                3           130           246                   1
## 1068  48   1                4           124           274                   0
## 1069  56   0                4           134           409                   0
## 1070  42   1                1           148           244                   0
## 1071  59   1                1           178           270                   0
## 1072  60   0                4           158           305                   0
## 1073  63   0                2           140           195                   0
## 1074  42   1                3           120           240                   1
## 1075  66   1                2           160           246                   0
## 1076  54   1                2           192           283                   0
## 1077  69   1                3           140           254                   0
## 1078  50   1                3           129           196                   0
## 1079  51   1                4           140           298                   0
## 1080  43   1                4           132           247                   1
## 1081  62   0                4           138           294                   1
## 1082  68   0                3           120           211                   0
## 1083  67   1                4           100           299                   0
## 1084  69   1                1           160           234                   1
## 1085  45   0                4           138           236                   0
## 1086  50   0                2           120           244                   0
## 1087  59   1                1           160           273                   0
## 1088  50   0                4           110           254                   0
## 1089  64   0                4           180           325                   0
## 1090  57   1                3           150           126                   1
## 1091  64   0                3           140           313                   0
## 1092  43   1                4           110           211                   0
## 1093  45   1                4           142           309                   0
## 1094  58   1                4           128           259                   0
## 1095  50   1                4           144           200                   0
## 1096  55   1                2           130           262                   0
## 1097  62   0                4           150           244                   0
## 1098  37   0                3           120           215                   0
## 1099  38   1                1           120           231                   0
## 1100  41   1                3           130           214                   0
## 1101  66   0                4           178           228                   1
## 1102  52   1                4           112           230                   0
## 1103  56   1                1           120           193                   0
## 1104  46   0                2           105           204                   0
## 1105  46   0                4           138           243                   0
## 1106  64   0                4           130           303                   0
## 1107  59   1                4           138           271                   0
## 1108  41   0                3           112           268                   0
## 1109  54   0                3           108           267                   0
## 1110  39   0                3            94           199                   0
## 1111  53   1                4           123           282                   0
```

```
## 1112  63   0                4           108           269                   0
## 1113  34   0                2           118           210                   0
## 1114  47   1                4           112           204                   0
## 1115  67   0                3           152           277                   0
## 1116  54   1                4           110           206                   0
## 1117  66   1                4           112           212                   0
## 1118  52   0                3           136           196                   0
## 1119  55   0                4           180           327                   0
## 1120  49   1                3           118           149                   0
## 1121  74   0                2           120           269                   0
## 1122  54   0                3           160           201                   0
## 1123  54   1                4           122           286                   0
## 1124  56   1                4           130           283                   1
## 1125  46   1                4           120           249                   0
## 1126  49   0                2           134           271                   0
## 1127  42   1                2           120           295                   0
## 1128  41   1                2           110           235                   0
## 1129  41   0                2           126           306                   0
## 1130  49   0                4           130           269                   0
## 1131  61   1                1           134           234                   0
## 1132  60   0                3           120           178                   1
## 1133  67   1                4           120           237                   0
## 1134  58   1                4           100           234                   0
## 1135  47   1                4           110           275                   0
## 1136  52   1                4           125           212                   0
## 1137  62   1                2           128           208                   1
## 1138  57   1                4           110           201                   0
## 1139  58   1                4           146           218                   0
## 1140  64   1                4           128           263                   0
## 1141  51   0                3           120           295                   0
## 1142  43   1                4           115           303                   0
## 1143  42   0                3           120           209                   0
## 1144  67   0                4           106           223                   0
## 1145  76   0                3           140           197                   0
## 1146  70   1                2           156           245                   0
## 1147  57   1                2           124           261                   0
## 1148  44   0                3           118           242                   0
## 1149  58   0                2           136           319                   1
## 1150  60   0                1           150           240                   0
## 1151  44   1                3           120           226                   0
## 1152  61   1                4           138           166                   0
## 1153  42   1                4           136           315                   0
## 1154  52   1                4           128           204                   1
## 1155  59   1                3           126           218                   1
## 1156  40   1                4           152           223                   0
## 1157  42   1                3           130           180                   0
## 1158  61   1                4           140           207                   0
## 1159  66   1                4           160           228                   0
## 1160  46   1                4           140           311                   0
## 1161  71   0                4           112           149                   0
```

```
## 1162  59   1              1          134         204                   0
## 1163  64   1              1          170         227                   0
## 1164  66   0              3          146         278                   0
## 1165  39   0              3          138         220                   0
## 1166  57   1              2          154         232                   0
## 1167  58   0              4          130         197                   0
## 1168  57   1              4          110         335                   0
## 1169  47   1              3          130         253                   0
## 1170  55   0              4          128         205                   0
## 1171  35   1              2          122         192                   0
## 1172  61   1              4          148         203                   0
## 1173  58   1              4          114         318                   0
## 1174  58   0              4          170         225                   1
## 1175  58   1              2          125         220                   0
## 1176  56   1              2          130         221                   0
## 1177  56   1              2          120         240                   0
## 1178  67   1              3          152         212                   0
## 1179  55   0              2          132         342                   0
## 1180  44   1              4          120         169                   0
## 1181  63   1              4          140         187                   0
## 1182  63   0              4          124         197                   0
## 1183  41   1              2          120         157                   0
## 1184  59   1              4          164         176                   1
## 1185  57   0              4          140         241                   0
## 1186  45   1              1          110         264                   0
## 1187  68   1              4          144         193                   1
## 1188  57   1              4          130         131                   0
## 1189  57   0              2          130         236                   0
## 1190  38   1              3          138         175                   0
##       resting.ecg max.heart.rate exercise.angina oldpeak ST.slope target
## 1               0            172               0     0.0        1      0
## 2               0            156               0     1.0        2      1
## 3               1             98               0     0.0        1      0
## 4               0            108               1     1.5        2      1
## 5               0            122               0     0.0        1      0
## 6               0            170               0     0.0        1      0
## 7               0            170               0     0.0        1      0
## 8               0            142               0     0.0        1      0
## 9               0            130               1     1.5        2      1
## 10              0            120               0     0.0        1      0
## 11              0            142               0     0.0        1      0
## 12              1             99               1     2.0        2      1
## 13              0            145               0     0.0        1      0
## 14              0            140               1     1.0        2      1
## 15              1            137               0     0.0        1      0
## 16              0            150               0     1.5        2      0
## 17              0            166               0     0.0        2      1
## 18              0            165               0     0.0        1      0
## 19              0            125               0     1.0        2      1
## 20              0            160               0     3.0        2      1
```

```
## 21             0          142          0    0.0       1      0
## 22             0          142          0    1.0       2      0
## 23             0          164          0    0.0       1      0
## 24             0          150          1    3.0       2      1
## 25             0          138          0    0.0       1      0
## 26             0          178          0    0.0       1      0
## 27             1          112          1    3.0       2      0
## 28             0          118          0    0.0       1      0
## 29             0          127          0    0.0       1      0
## 30             0          145          0    0.0       1      0
## 31             0          130          0    0.0       2      1
## 32             0          114          0    0.0       1      0
## 33             0          122          0    2.0       2      1
## 34             1          130          0    2.0       2      1
## 35             0          154          0    0.0       1      0
## 36             0          155          0    0.0       1      0
## 37             0           87          1    1.5       2      1
## 38             1          142          0    0.0       1      0
## 39             1          148          0    0.0       1      0
## 40             0          130          1    1.0       2      0
## 41             0          130          0    0.0       1      0
## 42             1          100          1    0.0       2      1
## 43             0          168          0    0.0       1      0
## 44             1          170          0    0.0       1      0
## 45             0          120          1    1.0       2      1
## 46             0          120          1    1.0       2      0
## 47             0          168          0    0.0       1      0
## 48             0          170          0    0.0       1      0
## 49             0          184          0    1.0       2      0
## 50             0          170          0    0.0       2      1
## 51             0          121          1    2.0       2      1
## 52             0           98          1    2.0       2      1
## 53             0          122          0    0.0       1      0
## 54             0          150          0    0.0       1      0
## 55             0          140          1    1.5       2      0
## 56             0          170          0    0.0       1      0
## 57             0          153          1    1.5       2      1
## 58             1          140          0    0.0       2      1
## 59             1          134          0    1.0       1      0
## 60             1           96          1    1.0       2      1
## 61             0          174          0    0.0       1      0
## 62             0          175          0    0.0       1      0
## 63             0          144          0    0.0       1      0
## 64             0          125          1    1.0       2      1
## 65             0          145          0    0.0       1      0
## 66             0          130          0    0.0       1      0
## 67             0          144          0    0.0       1      0
## 68             0          184          0    0.0       1      0
## 69             1           82          1    4.0       2      1
## 70             0          170          0    0.0       1      0
```

```
## 71                 1            145                 1      1.0           2       1
## 72                 0            135                 0      0.0           1       0
## 73                 0            150                 0      0.0           2       1
## 74                 1            115                 0      0.0           1       0
## 75                 0            128                 1      1.5           2       1
## 76                 0            116                 0      0.0           1       0
## 77                 0            130                 0      0.0           2       1
## 78                 0            150                 0      0.0           1       0
## 79                 0            138                 1      0.0           1       0
## 80                 0            170                 0      0.0           2       1
## 81                 0            160                 0      0.0           1       0
## 82                 0            154                 0      0.0           1       0
## 83                 0            115                 0      0.0           2       1
## 84                 0            165                 0      0.0           1       0
## 85                 0            125                 1      1.0           2       1
## 86                 0             94                 1      1.0           2       1
## 87                 0            112                 1      2.0           2       1
## 88                 0            142                 1      2.0           2       0
## 89                 1            155                 0      0.0           2       1
## 90                 0            110                 1      0.5           2       0
## 91                 0            160                 0      0.0           1       0
## 92                 0            140                 0      0.0           1       0
## 93                 0            148                 0      0.0           1       0
## 94                 0             92                 1      1.5           2       1
## 95                 1            180                 0      0.0           1       0
## 96                 0            140                 1      2.0           2       1
## 97                 0            138                 0      0.0           1       0
## 98                 0            160                 0      0.0           1       0
## 99                 0            140                 0      0.0           1       0
## 100                0            144                 0      0.0           1       0
## 101                1            115                 1      1.0           2       1
## 102                0            100                 0      0.0           1       0
## 103                0            130                 0      2.0           2       1
## 104                0            152                 1      1.0           2       1
## 105                0            124                 0      0.0           2       1
## 106                0            140                 0      0.0           1       0
## 107                1            110                 0      0.0           1       0
## 108                1            168                 0      0.0           1       0
## 109                0            135                 0      0.0           1       0
## 110                0            106                 0      0.0           1       0
## 111                0            124                 0      1.0           2       0
## 112                0             92                 1      3.0           2       1
## 113                0            125                 1      0.0           1       0
## 114                0            150                 0      0.0           1       0
## 115                1            135                 0      0.0           1       0
## 116                0            150                 1      1.0           2       1
## 117                0            170                 0      0.0           2       1
## 118                1            130                 1      1.5           2       1
## 119                1            185                 0      0.0           1       0
## 120                0            180                 0      0.0           2       1
```

```
## 121                 0            170                 0      0.0           2       1
## 122                 0            139                 0      0.0           1       0
## 123                 1            140                 0      0.0           1       0
## 124                 0            110                 1      1.0           2       1
## 125                 0            150                 0      0.0           1       0
## 126                 0            110                 0      0.0           1       0
## 127                 0            190                 0      0.0           1       0
## 128                 0            175                 0      2.0           1       0
## 129                 0            140                 0      0.0           1       0
## 130                 0            152                 1      1.5           2       0
## 131                 0            130                 0      0.0           1       0
## 132                 0            150                 1      0.0           2       1
## 133                 1            122                 1      2.0           2       1
## 134                 1            124                 1      1.5           2       1
## 135                 1            120                 1      1.0           2       0
## 136                 0            175                 0      0.0           2       1
## 137                 1            175                 0      0.0           1       0
## 138                 1            146                 0      2.0           1       0
## 139                 0            118                 1      0.0           2       1
## 140                 0            130                 1      2.0           2       1
## 141                 0             94                 1      2.5           2       1
## 142                 1            125                 1      2.5           2       1
## 143                 1            158                 1      3.0           2       1
## 144                 0            155                 0      0.0           1       0
## 145                 0            150                 0      1.0           2       1
## 146                 0            132                 0      0.0           1       0
## 147                 0            155                 0      0.0           1       0
## 148                 1            176                 0      0.0           1       0
## 149                 0            160                 0      0.0           1       0
## 150                 0            125                 1      1.0           2       1
## 151                 0            120                 0      0.0           1       0
## 152                 0            100                 0      0.0           1       0
## 153                 0            150                 0      0.0           1       0
## 154                 0            140                 0      0.0           1       0
## 155                 1            160                 0      0.0           1       0
## 156                 0            150                 1      3.0           2       1
## 157                 0            150                 1      1.0           2       1
## 158                 0            130                 0      0.0           1       0
## 159                 0            100                 1      2.0           2       1
## 160                 1            130                 0      1.0           1       0
## 161                 2            119                 1      0.0           2       1
## 162                 0             96                 1      0.0           2       1
## 163                 0            174                 0      0.0           1       0
## 164                 0            160                 0      0.0           1       0
## 165                 0            150                 0      0.0           1       0
## 166                 0            140                 0      0.0           1       0
## 167                 0            175                 0      2.0           2       1
## 168                 1            140                 1      5.0           2       1
## 169                 0            118                 0      0.0           1       0
## 170                 0            100                 0      0.0           1       0
```

```
## 171      0        160         0   0.0     1    0
## 172      0        160         0   0.0     1    0
## 173      0        188         0   0.0     1    0
## 174      0        162         0   0.0     1    0
## 175      0        172         0   0.0     1    0
## 176      0        134         1   2.0     2    1
## 177      0        135         1   2.0     2    1
## 178      0        105         0   1.5     2    1
## 179      0        150         0   0.0     1    0
## 180      0        150         0   0.0     1    0
## 181      0         90         0   0.0     1    0
## 182      0        120         1   2.0     2    1
## 183      0        150         0   0.0     1    0
## 184      0        124         1   2.0     2    1
## 185      1        140         1   1.0     2    0
## 186      0        130         0   0.0     1    0
## 187      1         92         0   0.0     2    1
## 188      0        110         0   0.0     1    0
## 189      0        138         1   1.0     2    1
## 190      0        110         1   1.0     2    0
## 191      1        120         1   1.5     2    1
## 192      1        120         0   0.0     1    0
## 193      1        116         0   0.0     1    0
## 194      0        160         0   0.0     1    0
## 195      0        110         0   0.0     1    0
## 196      0        180         0   0.0     1    0
## 197      0        116         0   0.0     1    0
## 198      0        132         0   1.0     2    0
## 199      0        136         0   0.0     1    0
## 200      0        116         1   0.0     2    1
## 201      0         98         0   1.0     2    0
## 202      0        150         0   0.0     1    0
## 203      0        150         0   0.0     1    0
## 204      0        146         0   0.0     1    0
## 205      1        150         0   0.0     1    0
## 206      0        100         0   0.0     1    0
## 207      0        140         1   0.0     1    0
## 208      2        180         0   0.0     1    0
## 209      0        140         0   0.0     2    1
## 210      2        185         0   0.0     1    0
## 211      0        140         0   0.0     2    1
## 212      0        110         0   0.0     2    1
## 213      0        140         1   0.0     2    1
## 214      0        128         1   1.0     1    0
## 215      1        164         0   0.0     1    0
## 216      0         98         1   1.5     2    1
## 217      1        170         0   0.0     1    0
## 218      0        150         0   0.0     2    1
## 219      0        137         0   0.0     1    0
## 220      0        150         0   0.0     1    0
```

```
## 221            0        170          0    0.0     1    0
## 222            0        112          0    0.0     2    1
## 223            0        150          1    1.0     2    1
## 224            0        125          0    0.0     1    0
## 225            0        185          0    0.0     1    0
## 226            0        137          0    0.0     1    0
## 227            0        150          0    0.0     2    1
## 228            0        140          0    0.0     1    0
## 229            0        134          1    2.5     2    1
## 230            0        170          0    0.0     1    0
## 231            1        184          0    0.0     1    0
## 232            0        158          0    0.0     1    0
## 233            0        167          0    0.0     1    0
## 234            0        129          0    0.0     1    0
## 235            0        142          0    0.0     1    0
## 236            1        140          0    0.0     1    0
## 237            0        160          1    1.0     2    0
## 238            0        118          1    3.0     2    1
## 239            0        136          0    0.0     2    1
## 240            0         99          1    2.0     2    1
## 241            0        102          1    3.0     2    1
## 242            0        155          0    0.0     1    0
## 243            0        142          1    2.0     2    1
## 244            0        143          1    2.0     2    1
## 245            0        118          0    0.0     1    0
## 246            0        103          1    1.0     2    1
## 247            0        137          0    2.0     1    0
## 248            0        150          1    1.5     2    1
## 249            1        150          1    2.0     3    1
## 250            1        130          1    1.0     2    1
## 251            0        120          1    1.0     2    1
## 252            0        135          0    0.0     2    1
## 253            0        115          0    2.0     2    1
## 254            1        115          1    0.0     1    0
## 255            0        152          0    1.0     1    0
## 256            0         96          1    2.0     2    1
## 257            0        130          0    0.0     1    0
## 258            2        150          0    0.0     1    0
## 259            0        172          0    0.0     1    0
## 260            0        120          0    0.5     1    0
## 261            0        155          0    0.0     1    0
## 262            0        165          1    0.0     1    0
## 263            0        138          0    1.0     1    0
## 264            0        115          1    0.0     2    1
## 265            0        125          0    0.0     2    1
## 266            0        145          1    1.0     2    1
## 267            0        175          0    0.0     1    0
## 268            0        110          1    1.0     2    1
## 269            0        150          0    0.0     1    0
## 270            0         91          1    1.0     2    1
```

```
## 271          0       145        0    2.0      2     0
## 272          0       140        0    0.0      1     0
## 273          0       165        0    0.0      1     0
## 274          0       130        1    3.0      2     1
## 275          2       134        0    0.0      1     0
## 276          0       180        0    0.0      1     0
## 277          0       100        0    0.0      1     0
## 278          0       150        0    2.0      2     1
## 279          0       126        1    1.5      2     1
## 280          1       126        1    0.8      2     0
## 281          1       155        0    0.0      1     0
## 282          2       135        0    0.0      1     0
## 283          0       122        0    2.0      2     1
## 284          0       160        1    2.0      1     0
## 285          1       160        0    0.0      1     0
## 286          0       170        0    0.0      1     0
## 287          0       120        0    0.0      1     0
## 288          0       140        0    0.0      1     0
## 289          0       132        0    0.0      1     0
## 290          1       156        0    2.0      1     0
## 291          0       180        0    0.0      1     0
## 292          0       138        0    0.0      1     0
## 293          0       135        0    1.0      1     0
## 294          0       148        0    0.0      1     0
## 418          1       112        1    3.0      2     1
## 419          1       127        0    0.0      1     0
## 420          1       140        1    1.5      3     1
## 421          1       149        1    2.5      1     1
## 422          2        99        1    1.3      2     0
## 424          1       105        1    0.0      2     1
## 427          1       157        0    0.5      2     1
## 428          1       140        0    0.0      1     0
## 433          1        86        0    0.0      1     0
## 434          0        84        1    2.5      3     1
## 435          0       125        1    2.0      2     1
## 445          1       140        1    0.5      2     1
## 446          0       120        1    1.5      2     1
## 447          1       124        1    1.6      2     1
## 449          1       110        1    2.0      1     1
## 450          0       105        1    1.0      2     1
## 454          1       118        1    1.5      2     1
## 456          0       123        1    1.2      2     1
## 462          1       118        1    1.9      2     1
## 464          0       117        1    1.3      3     1
## 467          0       160        0    0.0      1     0
## 470          1        97        1    1.6      1     1
## 471          0       161        0    2.0      2     0
## 475          1       122        1    1.7      2     1
## 478          2       139        0    0.1      1     0
## 480          1       148        1    2.0      2     1
```

```
## 484                  0            125                0      2.5          1       1
## 487                  1            128                1      1.2          2       1
## 488                  1            180                0      0.4          1       0
## 489                  1            144                1      2.0          2       1
## 490                  0            135                0      0.3          1       0
## 491                  0            140                1      3.0          2       1
## 492                  0            102                1      1.0          2       1
## 493                  1            108                0      0.0          2       1
## 495                  0            127                1      1.7          2       1
## 496                  0            110                1      2.5          2       1
## 497                  0            140                1      1.0          2       1
## 498                  0             69                0      1.0          3       0
## 499                  0            148                1      3.0          3       1
## 500                  1            130                1      0.0          2       1
## 501                  0            130                1      1.0          2       1
## 502                  0            140                1      4.0          3       1
## 503                  0            138                1      2.0          2       1
## 504                  1            140                1      2.0          2       1
## 505                  1            138                0      0.2          1       0
## 506                  0            112                1      3.0          3       1
## 507                  1            131                1      1.2          2       1
## 508                  0            112                1      3.0          2       1
## 509                  0             80                1      0.0          1       0
## 511                  0            110                0      0.0          2       1
## 512                  0            126                0      0.3          1       0
## 513                  1             88                1      2.0          2       1
## 514                  1            153                0     -0.1          1       0
## 515                  1            150                1      1.3          2       1
## 518                  0            132                0      0.0          0       1
## 519                  0            120                1      1.5          2       1
## 521                  1            121                1      1.0          1       1
## 522                  1            128                0      0.5          2       0
## 523                  1            135                1      4.0          3       1
## 524                  2            120                1      1.0          1       1
## 525                  0            117                1      1.0          2       1
## 526                  1            150                0      0.0          1       0
## 527                  0            144                0      0.1          1       0
## 528                  2            113                1      1.7          2       1
## 529                  0            135                0      0.3          1       0
## 530                  0            127                1      1.5          2       1
## 531                  0            109                1      1.4          2       1
## 532                  0            128                1      1.1          2       1
## 533                  1            115                1      1.8          2       1
## 534                  1            102                0      0.0          2       1
## 535                  1            140                1      2.0          2       1
## 536                  0            135                1      2.5          3       1
## 539                  1            130                1      4.0          3       1
## 540                  0            112                1      2.0          2       1
## 541                  2            100                0      0.0          1       0
## 542                  1            122                1      1.2          2       1
```

```
## 543           2          120              0     3.5          3      1
## 544           0          105              1     1.5          2      1
## 545           1          129              1     3.0          3      1
## 546           0          120              1     0.0          1      0
## 547           1          139              0     0.2          1      0
## 548           1          162              0     0.0          2      1
## 549           1          100              0     1.5          3      1
## 550           0          140              0     1.5          1      1
## 551           1          135              0     0.2          1      0
## 552           0           73              0     2.0          2      1
## 553           2           86              0     0.0          1      0
## 554           0          108              1     1.8          2      1
## 555           0          116              1     1.8          2      1
## 556           1          160              0     0.3          1      0
## 557           1          118              1     0.0          2      1
## 558           0          112              1     2.0          3      0
## 559           1          122              1     1.8          2      1
## 560           1          124              1     1.4          2      1
## 561           0          102              1     4.0          3      1
## 562           1          137              0     0.2          1      0
## 563           1          141              0     0.1          1      0
## 564           0          154              1     2.0          2      0
## 565           1          126              1     1.1          2      1
## 566           1          160              1     2.0          2      1
## 567           1          115              1     1.7          2      1
## 568           0          128              1     1.5          2      0
## 569           1          115              1     0.0          2      1
## 570           0          105              1     1.5          3      1
## 571           0          110              1     2.5          2      1
## 572           1          119              1     2.0          3      1
## 573           0          109              1     1.5          2      1
## 574           1          135              1     0.5          2      1
## 575           2          130              0     1.5          2      1
## 576           1          112              1     1.5          2      1
## 577           0          126              1     1.2          2      1
## 578           1          120              1     3.0          2      1
## 579           0          110              1     1.9          2      1
## 580           2          119              1     3.0          3      1
## 581           1          110              1     1.8          2      1
## 582           2          130              1     1.0          2      1
## 583           0          159              1     1.5          1      1
## 584           2           84              1     0.0          2      1
## 585           2          126              0     0.3          1      0
## 586           1          116              1     1.5          2      1
## 587           1          120              0     0.8          2      1
## 588           0          122              1     2.0          2      1
## 589           2          165              0     1.0          2      0
## 590           1          122              1     2.0          2      1
## 591           0           94              0     0.0          2      1
## 592           1          133              0     0.2          1      0
```

```
## 593          1          110          0     0.0       1      0
## 594          2          150          1     2.0       3      1
## 595          2          130          0     0.0       2      1
## 596          2          113          1     1.0       1      1
## 597          2          140          1     0.5       2      1
## 598          2          100          0     0.0       2      1
## 599          1          136          0     0.2       1      0
## 600          2          127          1     1.7       3      1
## 601          0           98          0     1.5       2      1
## 602          1           96          1     1.0       2      0
## 603          0          123          1     1.3       2      1
## 604          0           98          1     0.0       2      1
## 605          1          118          1     0.0       2      1
## 606          0          112          1     1.5       3      1
## 607          0          151          1     0.0       1      0
## 608          2           96          0     1.0       1      0
## 609          1          108          1     3.0       2      1
## 610          1          128          1     1.5       2      1
## 611          1          138          1     0.0       2      1
## 612          0          126          0     0.0       2      1
## 613          1          154          0     0.0       2      1
## 614          1          137          0     0.2       1      0
## 615          1          100          0     0.0       2      1
## 616          2          135          0     0.3       1      0
## 617          2           93          1     0.0       2      1
## 618          2          109          0     2.4       2      1
## 619          2          160          0     1.6       2      0
## 620          0          141          0     0.3       1      1
## 621          0          105          1     0.2       2      0
## 622          2          121          1     0.2       1      0
## 623          0          140          0     0.4       1      0
## 624          2          142          1     0.6       2      1
## 625          2          142          1     1.2       2      1
## 626          2          170          0     1.2       2      1
## 627          2          154          0     4.0       2      1
## 628          0          161          0     0.5       2      0
## 629          2          111          1     0.0       1      0
## 630          2          180          0     0.0       1      0
## 631          0          145          0     2.6       2      1
## 632          2          159          0     0.0       1      0
## 633          0          125          0     1.6       2      0
## 634          0          120          1     1.8       2      1
## 635          2          155          1     3.1       3      1
## 636          2          144          1     1.8       2      0
## 637          0          178          1     1.4       1      0
## 638          2          129          1     2.6       2      1
## 639          2          180          0     0.2       2      0
## 640          0          181          0     1.2       2      0
## 641          0          143          0     0.1       1      0
## 642          2          159          1     0.0       1      0
```

```
## 643              0            139              0     0.2         1      0
## 644              2            152              1     0.0         2      0
## 645              2            157              0     0.6         1      0
## 646              2            165              0     2.5         2      1
## 647              2            130              0     0.0         1      0
## 648              2            150              0     0.4         2      1
## 649              2            138              0     2.3         1      0
## 650              0            170              0     0.0         1      0
## 651              2            140              1     3.4         3      1
## 652              2            126              1     0.9         2      1
## 653              2            150              1     0.0         1      1
## 654              2            138              1     1.9         1      1
## 655              2            125              0     0.0         1      1
## 656              0            150              0     0.0         1      0
## 657              2            186              0     0.0         1      0
## 658              0            181              0     0.0         1      1
## 659              0            163              0     0.0         1      0
## 660              0            179              1     0.4         1      0
## 661              0            156              0     0.0         1      0
## 662              0            134              0     2.2         2      1
## 663              2            165              0     0.0         1      0
## 664              2            126              0     0.8         1      1
## 665              2            177              0     0.0         1      1
## 666              0            120              1     0.0         2      1
## 667              2            114              0     1.0         2      1
## 668              0            125              1     1.8         2      1
## 669              0            184              0     0.0         1      0
## 670              2            157              0     0.8         1      0
## 671              0            179              0     0.0         1      0
## 672              2            175              0     0.6         2      0
## 673              0            168              0     0.0         1      0
## 674              2            125              1     3.6         2      1
## 675              0             96              0     0.0         1      0
## 676              0            143              1     0.0         2      1
## 677              2            103              0     1.4         2      1
## 678              0            173              0     0.2         1      0
## 679              0            142              1     1.2         2      1
## 680              0            169              0     0.0         1      0
## 681              0            171              0     0.9         1      0
## 682              2            150              0     2.3         3      0
## 683              2            112              1     0.6         2      1
## 684              2            186              1     0.0         1      0
## 685              2            152              0     0.0         1      1
## 686              0            149              0     0.3         2      0
## 687              0            152              0     0.0         1      1
## 688              0            140              1     3.6         2      1
## 689              0            163              1     0.6         1      0
## 690              2            143              0     0.0         1      0
## 691              1            116              0     1.1         2      0
## 692              0            142              0     0.3         1      0
```

```
## 693          2          147          1     0.0      2      1
## 694          2          148          1     3.0      2      0
## 695          0          179          0     0.0      1      0
## 696          0          173          0     0.0      2      0
## 697          0          178          0     0.8      1      0
## 698          0          105          0     2.0      2      1
## 699          0          130          1     1.6      2      1
## 700          2          111          1     0.8      1      1
## 701          2          168          0     2.0      2      0
## 702          0          126          1     1.5      2      0
## 703          2          178          0     0.8      1      0
## 704          2          140          0     0.0      1      0
## 705          2          145          0     4.2      3      0
## 706          0          163          0     0.0      1      0
## 707          2          128          0     2.6      2      1
## 708          0          164          1     0.0      1      0
## 709          2          169          0     0.0      1      1
## 710          2          109          1     2.2      2      1
## 711          2          108          1     0.0      2      1
## 712          0          168          0     1.0      1      1
## 713          2          118          1     1.0      2      1
## 714          2          151          0     0.4      2      0
## 715          0          156          0     0.1      1      1
## 716          0          133          0     0.2      1      0
## 717          0          162          0     1.1      1      0
## 718          0          175          0     0.6      2      0
## 719          0           71          0     1.0      2      1
## 720          0          163          0     0.0      1      0
## 721          2          124          0     1.0      2      1
## 722          2          147          0     1.4      2      1
## 723          2          166          0     0.5      2      1
## 724          0          143          1     1.2      2      0
## 725          2          157          0     2.6      2      1
## 726          0          162          1     0.0      1      1
## 727          0          138          0     0.0      2      0
## 728          1          117          1     3.4      2      1
## 729          0          153          0     0.0      1      0
## 730          2          161          0     0.0      1      1
## 731          0          170          0     0.0      1      0
## 732          0          162          0     0.0      1      0
## 733          0          162          0     0.0      2      0
## 734          2          144          0     0.8      1      1
## 735          2          133          1     4.0      3      1
## 736          0          114          0     2.6      3      0
## 737          2          103          1     1.6      3      1
## 738          0          139          0     2.0      2      1
## 739          2          116          1     3.2      2      1
## 740          0           88          1     1.2      2      1
## 741          2          151          0     0.8      1      0
## 742          2          152          0     0.5      3      0
```

```
## 743                    0             163               0     0.0         1      0
## 744                    0              99               1     1.8         2      1
## 745                    2             169               0     0.1         2      0
## 746                    0             158               0     0.8         1      0
## 747                    0             160               1     1.4         1      1
## 748                    0             169               1     1.8         2      1
## 749                    2             132               1     0.1         1      1
## 750                    0             178               0     0.0         1      0
## 751                    2              96               1     2.2         3      1
## 752                    2             165               0     1.6         1      0
## 753                    2             160               1     1.4         3      0
## 754                    0             172               0     0.0         1      0
## 755                    2             144               1     1.2         2      1
## 756                    0             192               0     0.7         1      0
## 757                    0             168               1     0.0         1      0
## 758                    2             132               0     2.0         2      1
## 759                    2             182               0     0.0         1      0
## 760                    0             163               0     0.6         2      1
## 761                    2             125               1     1.4         1      0
## 762                    2             195               0     0.0         1      1
## 763                    0              95               1     2.0         2      1
## 764                    0             160               0     0.0         1      1
## 765                    2             114               1     2.0         2      1
## 766                    2             173               0     3.2         1      1
## 767                    2             172               1     0.0         1      0
## 768                    0             179               0     0.0         1      0
## 769                    0             158               0     1.6         2      0
## 770                    2             167               0     0.0         1      0
## 771                    0             122               0     2.0         2      0
## 772                    2             149               0     0.5         1      0
## 773                    0             172               0     0.0         1      0
## 774                    0             111               1     5.6         3      1
## 775                    2             170               0     0.0         1      0
## 776                    2             162               0     1.9         2      0
## 777                    0             165               1     1.0         2      1
## 778                    0             182               1     3.8         2      1
## 779                    0             154               1     1.4         2      1
## 780                    0             155               0     0.0         1      0
## 781                    2             130               1     3.0         2      1
## 782                    0             161               0     0.0         1      0
## 783                    0             154               1     0.0         1      0
## 784                    2             159               0     0.0         1      0
## 785                    2             152               0     1.2         3      0
## 786                    2             152               1     0.2         2      0
## 787                    2             174               0     1.4         2      1
## 788                    2             131               0     0.1         2      0
## 789                    2             146               0     2.0         2      1
## 790                    2             125               1     0.9         2      1
## 791                    2             115               0     1.5         2      0
## 792                    2             174               0     0.0         1      0
```

```
## 793                  0           106             0     1.9         2      1
## 794                  0           122             1     4.2         2      1
## 795                  0           147             0     3.6         2      1
## 796                  0           163             0     0.2         2      1
## 797                  0           163             0     0.0         1      0
## 798                  0           194             0     0.8         3      0
## 799                  2           150             1     1.9         2      1
## 800                  2           158             0     0.0         1      1
## 801                  2           122             0     0.6         2      0
## 802                  2           173             0     0.0         1      0
## 803                  0           162             0     1.9         1      0
## 804                  2           105             1     2.1         2      1
## 805                  0           147             0     0.1         1      0
## 806                  2           157             0     1.2         2      0
## 807                  0           112             1     2.9         2      1
## 808                  0           160             0     1.2         1      0
## 809                  0           125             1     2.6         3      1
## 810                  0           156             0     0.0         1      0
## 811                  2           156             1     0.0         1      1
## 812                  0           175             0     0.0         1      0
## 813                  2           161             0     1.4         2      0
## 814                  2           122             0     1.0         2      0
## 815                  0           158             0     1.6         2      0
## 816                  0           151             0     1.8         1      0
## 817                  2           162             1     0.0         1      1
## 818                  0           151             0     1.0         1      0
## 819                  2           171             0     0.0         1      1
## 820                  2           141             1     2.8         2      1
## 821                  0           173             1     1.6         1      1
## 822                  2           145             1     0.8         2      1
## 823                  0           178             0     1.2         2      0
## 824                  0           160             0     0.0         1      0
## 825                  2           154             1     0.6         2      0
## 826                  0           131             1     1.8         2      1
## 827                  0           187             0     3.5         3      0
## 828                  2           159             0     0.2         2      1
## 829                  2           166             0     2.4         2      0
## 830                  0           165             0     0.2         2      0
## 831                  2           131             1     2.2         2      1
## 832                  2           202             0     0.0         1      0
## 833                  2           172             0     1.4         1      0
## 834                  2           172             0     0.0         1      0
## 835                  0           154             1     0.0         1      0
## 836                  2           147             0     0.4         2      0
## 837                  0           170             0     0.0         1      0
## 838                  0           126             1     2.8         2      1
## 839                  2           127             0     2.8         2      1
## 840                  0           174             0     1.6         1      0
## 841                  2           132             1     1.8         1      1
## 842                  0           182             0     1.4         1      0
```

```
## 843                0             132             0     0.0         2      0
## 844                0              97             0     1.2         2      1
## 845                2             136             1     3.0         2      1
## 846                2             162             0     1.0         1      0
## 847                2             190             0     0.0         2      0
## 848                2             146             1     1.0         2      1
## 849                0             140             0     1.2         2      1
## 850                2             185             0     0.0         1      0
## 851                0             161             1     0.0         1      1
## 852                0             146             0     1.8         2      0
## 853                2             145             0     6.2         3      1
## 854                2             160             0     0.0         1      0
## 855                2             120             1     2.5         2      1
## 856                2             156             0     0.0         1      0
## 857                0             172             0     0.2         1      0
## 858                2             150             1     1.6         2      1
## 859                2             182             0     0.0         1      0
## 860                2             143             0     0.4         2      0
## 861                2             160             0     3.6         3      1
## 862                2             142             0     1.5         1      0
## 863                0             144             1     1.4         1      1
## 864                2             158             0     0.6         1      1
## 865                0             148             0     0.8         1      0
## 866                2             155             0     3.0         2      1
## 867                2             142             1     2.8         2      1
## 868                0             113             0     1.4         2      1
## 869                2             188             0     0.0         1      0
## 870                2             153             0     0.0         1      1
## 871                0             123             0     0.6         1      0
## 872                0             157             0     1.6         1      0
## 873                0             162             0     0.4         1      0
## 874                0             137             1     1.0         2      0
## 875                0             132             1     1.2         2      1
## 876                0             158             0     0.0         1      1
## 877                0             171             0     1.5         1      0
## 878                0             172             0     0.0         1      0
## 879                2             132             1     2.4         2      1
## 880                2             160             0     1.8         2      1
## 881                0             171             0     0.6         1      0
## 882                0             168             0     1.0         3      1
## 883                0             162             0     0.5         1      0
## 884                0             173             0     0.0         1      0
## 885                2             153             0     1.3         2      0
## 886                0             148             0     0.4         2      0
## 887                2             108             1     1.5         2      1
## 888                2             150             0     2.3         3      0
## 889                2             108             1     1.5         2      1
## 890                2             129             1     2.6         2      1
## 891                0             187             0     3.5         3      0
## 892                2             172             0     1.4         1      0
```

```
## 893              0              178              0      0.8         1       0
## 894              2              160              0      3.6         3       1
## 895              0              163              1      0.6         1       0
## 896              2              147              0      1.4         2       1
## 897              2              155              1      3.1         3       1
## 898              0              148              0      0.4         2       0
## 899              2              153              0      1.3         2       0
## 900              2              142              1      0.6         2       1
## 901              0              173              0      0.0         1       0
## 902              0              162              0      0.5         1       0
## 903              0              174              0      1.6         1       0
## 904              0              168              0      1.0         3       1
## 905              0              160              0      1.2         1       0
## 906              0              139              0      0.2         1       0
## 907              0              171              0      0.6         1       0
## 908              2              144              1      1.8         2       0
## 909              2              162              0      1.0         1       0
## 910              2              160              0      1.8         2       1
## 911              2              173              0      3.2         1       1
## 912              2              132              1      2.4         2       1
## 913              0              158              0      1.6         2       0
## 914              0              172              0      0.0         1       0
## 915              0              114              0      2.6         3       0
## 916              0              171              0      1.5         1       0
## 917              2              114              1      2.0         2       1
## 918              0              151              0      1.8         1       0
## 919              0              160              1      1.4         1       1
## 920              0              158              0      0.0         1       1
## 921              0              161              0      0.5         2       0
## 922              0              179              1      0.4         1       0
## 923              0              178              0      0.0         1       0
## 924              2              120              1      2.5         2       1
## 925              2              112              1      0.6         2       1
## 926              0              132              1      1.2         2       1
## 927              0              137              1      1.0         2       0
## 928              2              114              0      1.0         2       1
## 929              0              178              1      1.4         1       0
## 930              0              162              0      0.4         1       0
## 931              0              157              0      1.6         1       0
## 932              2              169              0      0.0         1       1
## 933              2              165              0      2.5         2       1
## 934              0              123              0      0.6         1       0
## 935              2              128              0      2.6         2       1
## 936              2              157              0      0.8         1       0
## 937              2              152              0      1.2         3       0
## 938              0              168              0      0.0         1       0
## 939              0              140              0      0.4         1       0
## 940              2              153              0      0.0         1       1
## 941              2              188              0      0.0         1       0
## 942              0              144              1      1.4         1       1
```

```
## 943                   2                 109                   1      2.2          2       1
## 944                   0                 163                   0      0.6          2       1
## 945                   2                 158                   0      0.0          1       1
## 946                   2                 152                   0      0.5          3       0
## 947                   2                 125                   1      1.4          1       0
## 948                   0                 142                   1      1.2          2       1
## 949                   2                 160                   1      1.4          3       0
## 950                   2                 131                   1      2.2          2       1
## 951                   0                 170                   0      0.0          1       0
## 952                   0                 113                   0      1.4          2       1
## 953                   2                 142                   1      2.8          2       1
## 954                   2                 155                   0      3.0          2       1
## 955                   2                 165                   0      1.6          1       0
## 956                   2                 140                   1      3.4          3       1
## 957                   0                 147                   0      3.6          2       1
## 958                   0                 148                   0      0.8          1       0
## 959                   0                 163                   0      0.2          2       1
## 960                   0                  99                   1      1.8          2       1
## 961                   2                 158                   0      0.6          1       1
## 962                   2                 177                   0      0.0          1       1
## 963                   2                 151                   0      0.8          1       0
## 964                   2                 141                   1      2.8          2       1
## 965                   2                 142                   0      1.5          1       0
## 966                   2                 180                   0      0.2          2       0
## 967                   2                 111                   1      0.8          1       1
## 968                   2                 148                   1      3.0          2       0
## 969                   2                 143                   0      0.4          2       0
## 970                   2                 182                   0      0.0          1       0
## 971                   2                 150                   1      1.6          2       1
## 972                   0                 172                   0      0.2          1       0
## 973                   2                 180                   0      0.0          1       0
## 974                   2                 156                   0      0.0          1       0
## 975                   2                 115                   0      0.0          1       0
## 976                   2                 160                   0      0.0          1       0
## 977                   2                 149                   0      0.5          1       0
## 978                   2                 151                   0      0.4          2       0
## 979                   2                 145                   0      6.2          3       1
## 980                   0                 146                   0      1.8          2       0
## 981                   0                 175                   0      0.6          2       0
## 982                   2                 172                   0      0.0          1       0
## 983                   0                 161                   1      0.0          1       1
## 984                   2                 142                   1      1.2          2       1
## 985                   2                 157                   0      2.6          2       1
## 986                   0                 158                   0      0.8          1       0
## 987                   2                 186                   0      0.0          1       0
## 988                   2                 185                   0      0.0          1       0
## 989                   2                 174                   0      0.0          1       0
## 990                   2                 159                   0      0.0          1       0
## 991                   2                 130                   0      0.0          1       0
## 992                   0                 139                   0      2.0          2       1
```

```
## 993             0         156        0    0.0     1    0
## 994             0         162        1    0.0     1    1
## 995             2         150        0    0.4     2    1
## 996             0         140        1    3.6     2    1
## 997             0         140        0    1.2     2    1
## 998             2         146        1    1.0     2    1
## 999             2         144        1    1.2     2    1
## 1000            2         190        0    0.0     2    0
## 1001            2         136        1    3.0     2    1
## 1002            0          97        0    1.2     2    1
## 1003            0         132        0    0.0     2    0
## 1004            2         165        0    0.0     1    0
## 1005            0         182        0    1.4     1    0
## 1006            2         132        1    1.8     1    1
## 1007            2         127        0    2.8     2    1
## 1008            2         150        1    0.0     1    1
## 1009            2         154        0    4.0     2    1
## 1010            0         143        1    1.2     2    0
## 1011            0         111        1    5.6     3    1
## 1012            2         174        0    1.4     2    1
## 1013            2         175        0    0.6     2    0
## 1014            2         133        1    4.0     3    1
## 1015            0         126        1    2.8     2    1
## 1016            0         170        0    0.0     1    0
## 1017            0         163        0    0.0     1    0
## 1018            2         147        0    0.4     2    0
## 1019            0         154        1    0.0     1    0
## 1020            2         202        0    0.0     1    0
## 1021            2         186        1    0.0     1    0
## 1022            0         165        0    0.2     2    0
## 1023            2         161        0    1.4     2    0
## 1024            0         125        1    2.6     3    1
## 1025            2         103        0    1.4     2    1
## 1026            0         130        1    1.6     2    1
## 1027            2         166        0    2.4     2    0
## 1028            0         164        1    0.0     1    0
## 1029            2         159        0    0.2     2    1
## 1030            0         184        0    0.0     1    0
## 1031            0         131        1    1.8     2    1
## 1032            2         154        1    0.6     2    0
## 1033            0         152        0    0.0     1    1
## 1034            2         124        0    1.0     2    1
## 1035            0         179        0    0.0     1    0
## 1036            2         170        0    0.0     1    0
## 1037            0         160        0    0.0     1    0
## 1038            0         178        0    1.2     2    0
## 1039            2         122        0    0.6     2    0
## 1040            2         160        0    1.6     2    0
## 1041            2         145        1    0.8     2    1
## 1042            2          96        1    2.2     3    1
```

```
## 1043          2        109         0    2.4      2     1
## 1044          0        173         1    1.6      1     1
## 1045          2        171         0    0.0      1     1
## 1046          2        170         0    1.2      2     1
## 1047          0        151         0    1.0      1     0
## 1048          0        156         0    0.0      1     0
## 1049          2        162         1    0.0      1     1
## 1050          0        158         0    1.6      2     0
## 1051          2        122         0    1.0      2     0
## 1052          0        175         0    0.0      1     0
## 1053          0        168         1    0.0      1     0
## 1054          0        169         0    0.0      1     0
## 1055          2        159         1    0.0      1     0
## 1056          2        156         1    0.0      1     1
## 1057          0        138         0    0.0      2     0
## 1058          0        112         1    2.9      2     1
## 1059          2        111         1    0.0      1     0
## 1060          0        143         1    0.0      2     1
## 1061          2        157         0    1.2      2     0
## 1062          2        132         0    2.0      2     1
## 1063          0         88         1    1.2      2     1
## 1064          0        147         0    0.1      1     0
## 1065          2        105         1    2.1      2     1
## 1066          0        162         0    1.9      1     0
## 1067          2        173         0    0.0      1     0
## 1068          2        166         0    0.5      2     1
## 1069          2        150         1    1.9      2     1
## 1070          2        178         0    0.8      1     0
## 1071          2        145         0    4.2      3     0
## 1072          2        161         0    0.0      1     1
## 1073          0        179         0    0.0      1     0
## 1074          0        194         0    0.8      3     0
## 1075          0        120         1    0.0      2     1
## 1076          2        195         0    0.0      1     1
## 1077          2        146         0    2.0      2     1
## 1078          0        163         0    0.0      1     0
## 1079          0        122         1    4.2      2     1
## 1080          2        143         1    0.1      2     1
## 1081          0        106         0    1.9      2     1
## 1082          2        115         0    1.5      2     0
## 1083          2        125         1    0.9      2     1
## 1084          2        131         0    0.1      2     0
## 1085          2        152         1    0.2      2     0
## 1086          0        162         0    1.1      1     0
## 1087          2        125         0    0.0      1     1
## 1088          2        159         0    0.0      1     0
## 1089          0        154         1    0.0      1     0
## 1090          0        173         0    0.2      1     0
## 1091          0        133         0    0.2      1     0
## 1092          0        161         0    0.0      1     0
```

```
## 1093            2         147           1    0.0     2    1
## 1094            2         130           1    3.0     2    1
## 1095            2         126           1    0.9     2    1
## 1096            0         155           0    0.0     1    0
## 1097            0         154           1    1.4     2    1
## 1098            0         170           0    0.0     1    0
## 1099            0         182           1    3.8     2    1
## 1100            2         168           0    2.0     2    0
## 1101            0         165           1    1.0     2    1
## 1102            0         160           0    0.0     1    1
## 1103            2         162           0    1.9     2    0
## 1104            0         172           0    0.0     1    0
## 1105            2         152           1    0.0     2    0
## 1106            0         122           0    2.0     2    0
## 1107            2         182           0    0.0     1    0
## 1108            2         172           1    0.0     1    0
## 1109            2         167           0    0.0     1    0
## 1110            0         179           0    0.0     1    0
## 1111            0          95           1    2.0     2    1
## 1112            0         169           1    1.8     2    1
## 1113            0         192           0    0.7     1    0
## 1114            0         143           0    0.1     1    0
## 1115            0         172           0    0.0     1    0
## 1116            2         108           1    0.0     2    1
## 1117            2         132           1    0.1     1    1
## 1118            2         169           0    0.1     2    0
## 1119            1         117           1    3.4     2    1
## 1120            2         126           0    0.8     1    1
## 1121            2         121           1    0.2     1    0
## 1122            0         163           0    0.0     1    0
## 1123            2         116           1    3.2     2    1
## 1124            2         103           1    1.6     3    1
## 1125            2         144           0    0.8     1    1
## 1126            0         162           0    0.0     2    0
## 1127            0         162           0    0.0     1    0
## 1128            0         153           0    0.0     1    0
## 1129            0         163           0    0.0     1    0
## 1130            0         163           0    0.0     1    0
## 1131            0         145           0    2.6     2    1
## 1132            0          96           0    0.0     1    0
## 1133            0          71           0    1.0     2    1
## 1134            0         156           0    0.1     1    1
## 1135            2         118           1    1.0     2    1
## 1136            0         168           0    1.0     1    1
## 1137            2         140           0    0.0     1    0
## 1138            0         126           1    1.5     2    0
## 1139            0         105           0    2.0     2    1
## 1140            0         105           1    0.2     2    0
## 1141            2         157           0    0.6     1    0
## 1142            0         181           0    1.2     2    0
```

```
## 1143              0              173                 0     0.0         2      0
## 1144              0              142                 0     0.3         1      0
## 1145              1              116                 0     1.1         2      0
## 1146              2              143                 0     0.0         1      0
## 1147              0              141                 0     0.3         1      1
## 1148              0              149                 0     0.3         2      0
## 1149              2              152                 0     0.0         1      1
## 1150              0              171                 0     0.9         1      0
## 1151              0              169                 0     0.0         1      0
## 1152              2              125                 1     3.6         2      1
## 1153              0              125                 1     1.8         2      1
## 1154              0              156                 1     1.0         2      1
## 1155              0              134                 0     2.2         2      1
## 1156              0              181                 0     0.0         1      1
## 1157              0              150                 0     0.0         1      0
## 1158              2              138                 1     1.9         1      1
## 1159              2              138                 0     2.3         1      0
## 1160              0              120                 1     1.8         2      1
## 1161              0              125                 0     1.6         2      0
## 1162              0              162                 0     0.8         1      1
## 1163              2              155                 0     0.6         2      0
## 1164              2              152                 0     0.0         2      0
## 1165              0              152                 0     0.0         2      0
## 1166              2              164                 0     0.0         1      1
## 1167              0              131                 0     0.6         2      0
## 1168              0              143                 1     3.0         2      1
## 1169              0              179                 0     0.0         1      0
## 1170              1              130                 1     2.0         2      1
## 1171              0              174                 0     0.0         1      0
## 1172              0              161                 0     0.0         1      1
## 1173              1              140                 0     4.4         3      1
## 1174              2              146                 1     2.8         2      1
## 1175              0              144                 0     0.4         2      0
## 1176              2              163                 0     0.0         1      0
## 1177              0              169                 0     0.0         3      0
## 1178              2              150                 0     0.8         2      1
## 1179              0              166                 0     1.2         1      0
## 1180              0              144                 1     2.8         3      1
## 1181              2              144                 1     4.0         1      1
## 1182              0              136                 1     0.0         2      1
## 1183              0              182                 0     0.0         1      0
## 1184              2               90                 0     1.0         2      1
## 1185              0              123                 1     0.2         2      1
## 1186              0              132                 0     1.2         2      1
## 1187              0              141                 0     3.4         2      1
## 1188              0              115                 1     1.2         2      1
## 1189              2              174                 0     0.0         2      1
## 1190              0              173                 0     0.0         1      0
```

```
heart_clean[heart_clean$fasting.blood.sugar >= min(heart_fbs_boxplot$out), ]
```

```
## Warning in min(heart_fbs_boxplot$out): no non-missing arguments to min;
## returning Inf

##  [1] age                  sex                  chest.pain.type
##  [4] resting.bp.s         cholesterol          fasting.blood.sugar
##  [7] resting.ecg          max.heart.rate       exercise.angina
## [10] oldpeak              ST.slope             target
## <0 rows> (or 0-length row.names)
```

```
heart_clean[heart_clean$max.heart.rate >= min(heart_mhr_boxplot$out), ]
```

```
##      age sex chest.pain.type resting.bp.s cholesterol fasting.blood.sugar
## 1     40   1               2          140         289                   0
## 2     49   0               3          160         180                   0
## 3     37   1               2          130         283                   0
## 4     48   0               4          138         214                   0
## 5     54   1               3          150         195                   0
## 6     39   1               3          120         339                   0
## 7     45   0               2          130         237                   0
## 8     54   1               2          110         208                   0
## 9     37   1               4          140         207                   0
## 10    48   0               2          120         284                   0
## 11    37   0               3          130         211                   0
## 12    58   1               2          136         164                   0
## 13    39   1               2          120         204                   0
## 14    49   1               4          140         234                   0
## 15    42   0               3          115         211                   0
## 16    54   0               2          120         273                   0
## 17    38   1               4          110         196                   0
## 18    43   0               2          120         201                   0
## 19    60   1               4          100         248                   0
## 20    36   1               2          120         267                   0
## 21    43   0               1          100         223                   0
## 22    44   1               2          120         184                   0
## 23    49   0               2          124         201                   0
## 24    44   1               2          150         288                   0
## 25    40   1               3          130         215                   0
## 26    36   1               3          130         209                   0
## 27    53   1               4          124         260                   0
## 28    52   1               2          120         284                   0
## 29    53   0               2          113         468                   0
## 30    51   1               2          125         188                   0
## 31    53   1               3          145         518                   0
## 32    56   1               3          130         167                   0
## 33    54   1               4          125         224                   0
## 34    41   1               4          130         172                   0
## 35    43   0               2          150         186                   0
## 36    32   1               2          125         254                   0
## 37    65   1               4          140         306                   1
## 38    41   0               2          110         250                   0
```

```
## 39    48   0          2        120        177             1
## 40    48   0          4        150        227             0
## 41    54   0          2        150        230             0
## 42    54   0          3        130        294             0
## 43    35   1          2        150        264             0
## 44    52   1          3        140        259             0
## 45    43   1          4        120        175             0
## 46    59   1          3        130        318             0
## 47    37   1          4        120        223             0
## 48    50   1          2        140        216             0
## 49    36   1          3        112        340             0
## 50    41   1          4        110        289             0
## 51    50   1          4        130        233             0
## 52    47   0          4        120        205             0
## 53    45   1          2        140        224             1
## 54    41   0          2        130        245             0
## 55    52   0          4        130        180             0
## 56    51   0          2        160        194             0
## 57    31   1          4        120        270             0
## 58    58   1          3        130        213             0
## 59    54   1          4        150        365             0
## 60    52   1          4        112        342             0
## 61    49   1          2        100        253             0
## 62    43   0          3        150        254             0
## 63    45   1          4        140        224             0
## 64    46   1          4        120        277             0
## 65    50   0          2        110        202             0
## 66    37   0          2        120        260             0
## 67    45   0          4        132        297             0
## 68    32   1          2        110        225             0
## 69    52   1          4        160        246             0
## 70    44   1          4        150        412             0
## 71    57   1          2        140        265             0
## 72    44   1          2        130        215             0
## 73    52   1          4        120        182             0
## 74    44   0          4        120        218             0
## 75    55   1          4        140        268             0
## 76    46   1          3        150        163             0
## 77    32   1          4        118        529             0
## 78    35   0          4        140        167             0
## 79    52   1          2        140        100             0
## 80    49   1          4        130        206             0
## 81    55   1          3        110        277             0
## 82    54   1          2        120        238             0
## 83    63   1          4        150        223             0
## 84    52   1          2        160        196             0
## 85    56   1          4        150        213             1
## 86    66   1          4        140        139             0
## 87    65   1          4        170        263             1
## 88    53   0          2        140        216             0
```

```
## 89    43  1       1     120     291       0
## 90    55  1       4     140     229       0
## 91    49  0       2     110     208       0
## 92    39  1       4     130     307       0
## 93    52  0       2     120     210       0
## 94    48  1       4     160     329       0
## 95    39  0       3     110     182       0
## 96    58  1       4     130     263       0
## 97    43  1       2     142     207       0
## 98    39  1       3     160     147       1
## 99    56  1       4     120      85       0
## 100   41  1       2     125     269       0
## 101   65  1       4     130     275       0
## 102   51  1       4     130     179       0
## 103   40  0       4     150     392       0
## 104   40  1       4     120     466       1
## 105   46  1       4     118     186       0
## 106   57  1       2     140     260       1
## 107   48  0       4     120     254       0
## 108   34  1       2     150     214       0
## 109   50  1       4     140     129       0
## 110   39  1       2     190     241       0
## 111   59  0       2     130     188       0
## 112   57  1       4     150     255       0
## 113   47  1       4     140     276       1
## 114   38  1       2     140     297       0
## 115   49  0       3     130     207       0
## 116   33  0       4     100     246       0
## 117   38  1       4     120     282       0
## 118   59  0       4     130     338       1
## 119   35  0       1     120     160       0
## 120   34  1       1     140     156       0
## 121   47  0       3     135     248       1
## 122   52  0       3     125     272       0
## 123   46  1       4     110     240       0
## 124   58  0       2     180     393       0
## 125   58  1       2     130     230       0
## 126   54  1       2     120     246       0
## 127   34  0       2     130     161       0
## 128   48  0       4     108     163       0
## 129   54  0       2     120     230       1
## 130   42  1       3     120     228       0
## 131   38  1       3     145     292       0
## 132   46  1       4     110     202       0
## 133   56  1       4     170     388       0
## 134   56  1       4     150     230       0
## 135   61  0       4     130     294       0
## 136   49  1       3     115     265       0
## 137   43  0       2     120     215       0
## 138   39  1       2     120     241       0
```

```
## 139   54   1                4           140          166                   0
## 140   43   1                4           150          247                   0
## 141   52   1                4           160          331                   0
## 142   50   1                4           140          341                   0
## 143   47   1                4           160          291                   0
## 144   53   1                4           140          243                   0
## 145   56   0                2           120          279                   0
## 146   39   1                4           110          273                   0
## 147   42   1                2           120          198                   0
## 148   43   0                2           120          249                   0
## 149   50   1                2           120          168                   0
## 150   54   1                4           130          603                   1
## 151   39   1                2           130          215                   0
## 152   48   1                2           100          159                   0
## 153   40   1                2           130          275                   0
## 154   55   1                4           120          270                   0
## 155   41   1                2           120          291                   0
## 156   56   1                4           155          342                   1
## 157   38   1                4           110          190                   0
## 158   49   1                4           140          185                   0
## 159   44   1                4           130          290                   0
## 160   54   1                2           160          195                   0
## 161   59   1                4           140          264                   1
## 162   49   1                4           128          212                   0
## 163   47   1                2           160          263                   0
## 164   49   0                2           110          208                   0
## 165   42   1                2           120          196                   0
## 166   52   0                2           140          225                   0
## 167   46   1                1           140          272                   1
## 168   50   1                4           140          231                   0
## 169   48   1                2           140          238                   0
## 170   58   1                4           135          222                   0
## 171   58   1                3           140          179                   0
## 172   29   1                2           120          243                   0
## 173   40   1                3           140          235                   0
## 174   53   1                2           140          320                   0
## 175   49   1                3           140          187                   0
## 176   52   1                4           140          266                   0
## 177   43   1                4           140          288                   0
## 178   54   1                4           140          216                   0
## 179   59   1                2           140          287                   0
## 180   37   1                3           130          194                   0
## 181   46   0                4           130          238                   0
## 182   52   1                4           130          225                   0
## 183   51   1                2           130          224                   0
## 184   52   1                4           140          404                   0
## 185   46   1                4           110          238                   0
## 186   54   0                2           160          312                   0
## 187   58   1                3           160          211                   1
## 188   58   1                2           130          251                   0
```

```
## 189   41  1          4      120      237          1
## 190   50  0          4      120      328          0
## 191   53  1          4      180      285          0
## 192   46  1          4      180      280          0
## 193   50  1          2      170      209          0
## 194   48  1          2      130      245          0
## 195   45  1          3      135      192          0
## 196   41  0          2      125      184          0
## 197   62  0          1      160      193          0
## 198   49  1          4      120      297          0
## 199   42  1          2      150      268          0
## 200   53  1          4      120      246          0
## 201   57  0          1      130      308          0
## 202   47  1          1      110      249          0
## 203   46  1          3      120      230          0
## 204   42  1          3      160      147          0
## 205   31  0          2      100      219          0
## 206   56  1          2      130      184          0
## 207   50  1          4      150      215          0
## 208   35  1          2      120      308          0
## 209   35  1          2      110      257          0
## 210   28  1          2      130      132          0
## 211   54  1          4      125      216          0
## 212   48  1          4      106      263          1
## 213   50  0          3      140      288          0
## 214   56  1          3      130      276          0
## 215   56  0          3      130      219          0
## 216   47  1          4      150      226          0
## 217   30  0          1      170      237          0
## 218   39  1          4      110      280          0
## 219   54  1          3      120      217          0
## 220   55  1          2      140      196          0
## 221   29  1          2      140      263          0
## 222   46  1          4      130      222          0
## 223   51  0          4      160      303          0
## 224   48  0          3      120      195          0
## 225   33  1          3      120      298          0
## 226   55  1          2      120      256          1
## 227   50  1          4      145      264          0
## 228   53  1          3      120      195          0
## 229   38  1          4       92      117          0
## 230   41  1          2      120      295          0
## 231   37  0          4      130      173          0
## 232   37  1          4      130      315          0
## 233   40  1          3      130      281          0
## 234   38  0          2      120      275          0
## 235   41  1          4      112      250          0
## 236   54  0          2      140      309          0
## 237   39  1          2      120      200          0
## 238   41  1          4      120      336          0
```

```
## 239   55   1                 1           140           295                    0
## 240   48   1                 4           160           355                    0
## 241   48   1                 4           160           193                    0
## 242   55   1                 2           145           326                    0
## 243   54   1                 4           200           198                    0
## 244   55   1                 2           160           292                    1
## 245   43   0                 2           120           266                    0
## 246   48   1                 4           160           268                    0
## 247   54   1                 1           120           171                    0
## 248   54   1                 3           120           237                    0
## 249   48   1                 4           122           275                    1
## 250   45   1                 4           130           219                    0
## 251   49   1                 4           130           341                    0
## 252   44   1                 4           135           491                    0
## 253   48   1                 4           120           260                    0
## 254   61   1                 4           125           292                    0
## 255   62   1                 2           140           271                    0
## 256   55   1                 4           145           248                    0
## 257   53   0                 3           120           274                    0
## 258   55   0                 2           130           394                    0
## 259   36   1                 3           150           160                    0
## 260   51   0                 3           150           200                    0
## 261   55   0                 2           122           320                    0
## 262   46   1                 2           140           275                    0
## 263   54   0                 2           120           221                    0
## 264   46   1                 4           120           231                    0
## 265   59   1                 4           130           126                    0
## 266   47   1                 3           140           193                    0
## 267   54   1                 2           160           305                    0
## 268   52   1                 4           130           298                    0
## 269   34   1                 2            98           220                    0
## 270   54   1                 4           130           242                    0
## 271   47   0                 3           130           235                    0
## 272   45   1                 4           120           225                    0
## 273   32   0                 2           105           198                    0
## 274   55   1                 4           140           201                    0
## 275   55   1                 3           120           220                    0
## 276   45   0                 2           180           295                    0
## 277   59   1                 3           180           213                    0
## 278   51   1                 3           135           160                    0
## 279   52   1                 4           170           223                    0
## 280   57   0                 4           180           347                    0
## 281   54   0                 2           130           253                    0
## 282   60   1                 3           120           246                    0
## 283   49   1                 4           150           222                    0
## 284   51   0                 3           130           220                    0
## 285   55   0                 2           110           344                    0
## 286   42   1                 4           140           358                    0
## 287   51   0                 3           110           190                    0
## 288   59   1                 4           140           169                    0
```

```
## 289   53   1              2          120         181                0
## 290   48   0              2          133         308                0
## 291   36   1              2          120         166                0
## 292   48   1              3          110         211                0
## 293   47   0              2          140         257                0
## 294   53   1              4          130         182                0
## 418   63   1              4          140         260                0
## 419   44   1              4          130         209                0
## 420   60   1              4          132         218                0
## 421   55   1              4          142         228                0
## 422   66   1              3          110         213                1
## 424   65   1              4          150         236                1
## 427   60   1              2          160         267                1
## 428   56   1              2          126         166                0
## 433   62   1              4          120         220                0
## 434   63   1              4          170         177                0
## 435   46   1              4          110         236                0
## 445   60   1              4          130         186                1
## 446   56   1              4          120         100                0
## 447   55   1              3          136         228                0
## 449   77   1              4          124         171                0
## 450   63   1              4          160         230                1
## 454   60   1              4          140         281                0
## 456   58   1              4          136         203                1
## 462   57   1              4          139         277                1
## 464   59   1              4          122         233                0
## 467   42   1              3          134         240                0
## 470   62   1              4          152         153                0
## 471   56   1              2          124         224                1
## 475   60   1              3          141         316                1
## 478   51   1              4          132         218                1
## 480   57   1              4          130         311                1
## 484   67   1              1          142         270                1
## 487   63   1              2          139         217                1
## 488   55   1              2          110         214                1
## 489   57   1              4          140         214                0
## 490   65   1              1          140         252                0
## 491   54   1              4          136         220                0
## 492   72   1              3          120         214                0
## 493   75   1              4          170         203                1
## 495   51   1              3          137         339                0
## 496   60   1              4          142         216                0
## 497   64   0              4          142         276                0
## 498   58   1              4          132         458                1
## 499   61   1              4          146         241                0
## 500   67   1              4          160         384                1
## 501   62   1              4          135         297                0
## 502   65   1              4          136         248                0
## 503   63   1              4          130         308                0
## 504   69   1              4          140         208                0
```

```
## 505   51   1                 4          132          227                       1
## 506   62   1                 4          158          210                       1
## 507   55   1                 3          136          245                       1
## 508   75   1                 4          136          225                       0
## 509   40   1                 3          106          240                       0
## 511   58   1                 4          110          198                       0
## 512   60   1                 4          136          195                       0
## 513   63   1                 4          160          267                       1
## 514   35   1                 3          123          161                       0
## 515   62   1                 1          112          258                       0
## 518   68   1                 3          150          195                       1
## 519   65   1                 4          150          235                       0
## 521   63   1                 4           96          305                       0
## 522   64   1                 4          130          223                       0
## 523   61   1                 4          120          282                       0
## 524   50   1                 4          144          349                       0
## 525   59   1                 4          124          160                       0
## 526   55   1                 4          150          160                       0
## 527   45   1                 3          130          236                       0
## 528   65   1                 4          144          312                       0
## 529   61   1                 2          139          283                       0
## 530   49   1                 3          131          142                       0
## 531   72   1                 4          143          211                       0
## 532   50   1                 4          133          218                       0
## 533   64   1                 4          143          306                       1
## 534   55   1                 4          116          186                       1
## 535   63   1                 4          110          252                       0
## 536   59   1                 4          125          222                       0
## 539   74   1                 4          150          258                       1
## 540   54   1                 4          130          202                       1
## 541   57   1                 4          110          197                       0
## 542   62   1                 3          138          204                       0
## 543   76   1                 3          104          113                       0
## 544   54   0                 4          138          274                       0
## 545   70   1                 4          170          192                       0
## 546   61   0                 2          140          298                       1
## 547   48   1                 4          132          272                       0
## 548   48   1                 3          132          220                       1
## 549   61   1                 1          142          200                       1
## 550   66   1                 4          112          261                       0
## 551   68   1                 1          139          181                       1
## 552   55   1                 4          172          260                       0
## 553   62   1                 3          120          220                       0
## 554   71   1                 3          144          221                       0
## 555   74   1                 1          145          216                       1
## 556   53   1                 3          155          175                       1
## 557   58   1                 3          150          219                       0
## 558   75   1                 4          160          310                       1
## 559   56   1                 3          137          208                       1
## 560   58   1                 3          137          232                       0
```

```
## 561   64  1           4       134     273           0
## 562   54  1           3       133     203           0
## 563   54  1           2       132     182           0
## 564   59  1           4       140     274           0
## 565   55  1           4       135     204           1
## 566   57  1           4       144     270           1
## 567   61  1           4       141     292           0
## 568   41  1           4       150     171           0
## 569   71  1           4       130     221           0
## 570   38  1           4       110     289           0
## 571   55  1           4       158     217           0
## 572   56  1           4       128     223           0
## 573   69  1           4       140     110           1
## 574   64  1           4       150     193           0
## 575   72  1           4       160     123           1
## 576   69  1           4       142     210           1
## 577   56  1           4       137     282           1
## 578   62  1           4       139     170           0
## 579   67  1           4       146     369           0
## 580   57  1           4       156     173           0
## 581   69  1           4       145     289           1
## 582   51  1           4       131     152           1
## 583   48  1           4       140     208           0
## 584   69  1           4       122     216           1
## 585   69  1           3       142     271           0
## 586   64  1           4       141     244           1
## 587   57  1           2       180     285           1
## 588   53  1           4       124     243           0
## 589   37  1           3       118     240           0
## 590   67  1           4       140     219           0
## 591   74  1           3       140     237           1
## 592   63  1           2       136     165           0
## 593   58  1           4       100     213           0
## 594   61  1           4       190     287           1
## 595   64  1           4       130     258           1
## 596   58  1           4       160     256           1
## 597   60  1           4       130     186           1
## 598   57  1           4       122     264           0
## 599   55  1           3       133     185           0
## 600   55  1           4       120     226           0
## 601   56  1           4       130     203           1
## 602   57  1           4       130     207           0
## 603   61  1           3       140     284           0
## 604   61  1           3       120     337           0
## 605   58  1           3       150     219           0
## 606   74  1           4       155     310           0
## 607   68  1           3       134     254           1
## 608   51  0           4       114     258           1
## 609   62  1           4       160     254           1
## 610   53  1           4       144     300           1
```

```
## 611   62   1                4           158           170                    0
## 612   46   1                4           134           310                    0
## 613   54   0                4           127           333                    1
## 614   62   1                1           135           139                    0
## 615   55   1                4           122           223                    1
## 616   58   1                4           140           385                    1
## 617   62   1                2           120           254                    0
## 618   70   1                4           130           322                    0
## 619   67   0                3           115           564                    0
## 620   57   1                2           124           261                    0
## 621   64   1                4           128           263                    0
## 622   74   0                2           120           269                    0
## 623   65   1                4           120           177                    0
## 624   56   1                3           130           256                    1
## 625   59   1                4           110           239                    0
## 626   60   1                4           140           293                    0
## 627   63   0                4           150           407                    0
## 628   59   1                4           135           234                    0
## 629   53   1                4           142           226                    0
## 630   44   1                3           140           235                    0
## 631   61   1                1           134           234                    0
## 632   57   0                4           128           303                    0
## 633   71   0                4           112           149                    0
## 634   46   1                4           140           311                    0
## 635   53   1                4           140           203                    1
## 636   64   1                1           110           211                    0
## 637   40   1                1           140           199                    0
## 638   67   1                4           120           229                    0
## 639   48   1                2           130           245                    0
## 640   43   1                4           115           303                    0
## 641   47   1                4           112           204                    0
## 642   54   0                2           132           288                    1
## 643   48   0                3           130           275                    0
## 644   46   0                4           138           243                    0
## 645   51   0                3           120           295                    0
## 646   58   1                3           112           230                    0
## 647   71   0                3           110           265                    1
## 648   57   1                3           128           229                    0
## 649   66   1                4           160           228                    0
## 650   37   0                3           120           215                    0
## 651   59   1                4           170           326                    0
## 652   50   1                4           144           200                    0
## 653   48   1                4           130           256                    1
## 654   61   1                4           140           207                    0
## 655   59   1                1           160           273                    0
## 656   42   1                3           130           180                    0
## 657   48   1                4           122           222                    0
## 658   40   1                4           152           223                    0
## 659   62   0                4           124           209                    0
## 660   44   1                3           130           233                    0
```

```
## 661   46  1               2          101          197               1
## 662   59  1               3          126          218               1
## 663   58  1               3          140          211               1
## 664   49  1               3          118          149               0
## 665   44  1               4          110          197               0
## 666   66  1               2          160          246               0
## 667   65  0               4          150          225               0
## 668   42  1               4          136          315               0
## 669   52  1               2          128          205               1
## 670   65  0               3          140          417               1
## 671   63  0               2          140          195               0
## 672   45  0               2          130          234               0
## 673   41  0               2          105          198               0
## 674   61  1               4          138          166               0
## 675   60  0               3          120          178               1
## 676   59  0               4          174          249               0
## 677   62  1               2          120          281               0
## 678   57  1               3          150          126               1
## 679   51  0               4          130          305               0
## 680   44  1               3          120          226               0
## 681   60  0               1          150          240               0
## 682   63  1               1          145          233               1
## 683   57  1               4          150          276               0
## 684   51  1               4          140          261               0
## 685   58  0               2          136          319               1
## 686   44  0               3          118          242               0
## 687   47  1               3          108          243               0
## 688   61  1               4          120          260               0
## 689   57  0               4          120          354               0
## 690   70  1               2          156          245               0
## 691   76  0               3          140          197               0
## 692   67  0               4          106          223               0
## 693   45  1               4          142          309               0
## 694   45  1               4          104          208               0
## 695   39  0               3           94          199               0
## 696   42  0               3          120          209               0
## 697   56  1               2          120          236               0
## 698   58  1               4          146          218               0
## 699   35  1               4          120          198               0
## 700   58  1               4          150          270               0
## 701   41  1               3          130          214               0
## 702   57  1               4          110          201               0
## 703   42  1               1          148          244               0
## 704   62  1               2          128          208               1
## 705   59  1               1          178          270               0
## 706   41  0               2          126          306               0
## 707   50  1               4          150          243               0
## 708   59  1               2          140          221               0
## 709   61  0               4          130          330               0
## 710   54  1               4          124          266               0
```

##	711	54	1	4	110	206	0
##	712	52	1	4	125	212	0
##	713	47	1	4	110	275	0
##	714	66	1	4	120	302	0
##	715	58	1	4	100	234	0
##	716	64	0	3	140	313	0
##	717	50	0	2	120	244	0
##	718	44	0	3	108	141	0
##	719	67	1	4	120	237	0
##	720	49	0	4	130	269	0
##	721	57	1	4	165	289	1
##	722	63	1	4	130	254	0
##	723	48	1	4	124	274	0
##	724	51	1	3	100	222	0
##	725	60	0	4	150	258	0
##	726	59	1	4	140	177	0
##	727	45	0	2	112	160	0
##	728	55	0	4	180	327	0
##	729	41	1	2	110	235	0
##	730	60	0	4	158	305	0
##	731	54	0	3	135	304	1
##	732	42	1	2	120	295	0
##	733	49	0	2	134	271	0
##	734	46	1	4	120	249	0
##	735	56	0	4	200	288	1
##	736	66	0	1	150	226	0
##	737	56	1	4	130	283	1
##	738	49	1	3	120	188	0
##	739	54	1	4	122	286	0
##	740	57	1	4	152	274	0
##	741	65	0	3	160	360	0
##	742	54	1	3	125	273	0
##	743	54	0	3	160	201	0
##	744	62	1	4	120	267	0
##	745	52	0	3	136	196	0
##	746	52	1	2	134	201	0
##	747	60	1	4	117	230	1
##	748	63	0	4	108	269	0
##	749	66	1	4	112	212	0
##	750	42	1	4	140	226	0
##	751	64	1	4	120	246	0
##	752	54	1	3	150	232	0
##	753	46	0	3	142	177	0
##	754	67	0	3	152	277	0
##	755	56	1	4	125	249	1
##	756	34	0	2	118	210	0
##	757	57	1	4	132	207	0
##	758	64	1	4	145	212	0
##	759	59	1	4	138	271	0
##	760	50	1	3	140	233	0

```
## 761    51    1                  1            125            213                      0
## 762    54    1                  2            192            283                      0
## 763    53    1                  4            123            282                      0
## 764    52    1                  4            112            230                      0
## 765    40    1                  4            110            167                      0
## 766    58    1                  3            132            224                      0
## 767    41    0                  3            112            268                      0
## 768    41    1                  3            112            250                      0
## 769    50    0                  3            120            219                      0
## 770    54    0                  3            108            267                      0
## 771    64    0                  4            130            303                      0
## 772    51    0                  3            130            256                      0
## 773    46    0                  2            105            204                      0
## 774    55    1                  4            140            217                      0
## 775    45    1                  2            128            308                      0
## 776    56    1                  1            120            193                      0
## 777    66    0                  4            178            228                      1
## 778    38    1                  1            120            231                      0
## 779    62    0                  4            150            244                      0
## 780    55    1                  2            130            262                      0
## 781    58    1                  4            128            259                      0
## 782    43    1                  4            110            211                      0
## 783    64    0                  4            180            325                      0
## 784    50    0                  4            110            254                      0
## 785    53    1                  3            130            197                      1
## 786    45    0                  4            138            236                      0
## 787    65    1                  1            138            282                      1
## 788    69    1                  1            160            234                      1
## 789    69    1                  3            140            254                      0
## 790    67    1                  4            100            299                      0
## 791    68    0                  3            120            211                      0
## 792    34    1                  1            118            182                      0
## 793    62    0                  4            138            294                      1
## 794    51    1                  4            140            298                      0
## 795    46    1                  3            150            231                      0
## 796    67    1                  4            125            254                      1
## 797    50    1                  3            129            196                      0
## 798    42    1                  3            120            240                      1
## 799    56    0                  4            134            409                      0
## 800    41    1                  4            110            172                      0
## 801    42    0                  4            102            265                      0
## 802    53    1                  3            130            246                      1
## 803    43    1                  3            130            315                      0
## 804    56    1                  4            132            184                      0
## 805    52    1                  4            108            233                      1
## 806    62    0                  4            140            394                      0
## 807    70    1                  3            160            269                      0
## 808    54    1                  4            140            239                      0
## 809    70    1                  4            145            174                      0
## 810    54    1                  2            108            309                      0
```

```
## 811   35   1               4          126        282                 0
## 812   48   1               3          124        255                 1
## 813   55   0               2          135        250                 0
## 814   58   0               4          100        248                 0
## 815   54   0               3          110        214                 0
## 816   69   0               1          140        239                 0
## 817   77   1               4          125        304                 0
## 818   68   1               3          118        277                 0
## 819   58   1               4          125        300                 0
## 820   60   1               4          125        258                 0
## 821   51   1               4          140        299                 0
## 822   55   1               4          160        289                 0
## 823   52   1               1          152        298                 1
## 824   60   0               3          102        318                 0
## 825   58   1               3          105        240                 0
## 826   64   1               3          125        309                 0
## 827   37   1               3          130        250                 0
## 828   59   1               1          170        288                 0
## 829   51   1               3          125        245                 1
## 830   43   0               3          122        213                 0
## 831   58   1               4          128        216                 0
## 832   29   1               2          130        204                 0
## 833   41   0               2          130        204                 0
## 834   63   0               3          135        252                 0
## 835   51   1               3           94        227                 0
## 836   54   1               3          120        258                 0
## 837   44   1               2          120        220                 0
## 838   54   1               4          110        239                 0
## 839   65   1               4          135        254                 0
## 840   57   1               3          150        168                 0
## 841   63   1               4          130        330                 1
## 842   35   0               4          138        183                 0
## 843   41   1               2          135        203                 0
## 844   62   0               3          130        263                 0
## 845   43   0               4          132        341                 1
## 846   58   0               1          150        283                 1
## 847   52   1               1          118        186                 0
## 848   61   0               4          145        307                 0
## 849   39   1               4          118        219                 0
## 850   45   1               4          115        260                 0
## 851   52   1               4          128        255                 0
## 852   62   1               3          130        231                 0
## 853   62   0               4          160        164                 0
## 854   53   0               4          138        234                 0
## 855   43   1               4          120        177                 0
## 856   47   1               3          138        257                 0
## 857   52   1               2          120        325                 0
## 858   68   1               3          180        274                 1
## 859   39   1               3          140        321                 0
## 860   53   0               4          130        264                 0
```

```
## 861   62   0                4           140          268                0
## 862   51   0                3           140          308                0
## 863   60   1                4           130          253                0
## 864   65   1                4           110          248                0
## 865   65   0                3           155          269                0
## 866   60   1                3           140          185                0
## 867   60   1                4           145          282                0
## 868   54   1                4           120          188                0
## 869   44   1                2           130          219                0
## 870   44   1                4           112          290                0
## 871   51   1                3           110          175                0
## 872   59   1                3           150          212                1
## 873   71   0                2           160          302                0
## 874   61   1                3           150          243                1
## 875   55   1                4           132          353                0
## 876   64   1                3           140          335                0
## 877   43   1                4           150          247                0
## 878   58   0                3           120          340                0
## 879   60   1                4           130          206                0
## 880   58   1                2           120          284                0
## 881   49   1                2           130          266                0
## 882   48   1                2           110          229                0
## 883   52   1                3           172          199                1
## 884   44   1                2           120          263                0
## 885   56   0                2           140          294                0
## 886   57   1                4           140          192                0
## 887   67   1                4           160          286                0
## 888   63   1                1           145          233                1
## 889   67   1                4           160          286                0
## 890   67   1                4           120          229                0
## 891   37   1                3           130          250                0
## 892   41   0                2           130          204                0
## 893   56   1                2           120          236                0
## 894   62   0                4           140          268                0
## 895   57   0                4           120          354                0
## 896   63   1                4           130          254                0
## 897   53   1                4           140          203                1
## 898   57   1                4           140          192                0
## 899   56   0                2           140          294                0
## 900   56   1                3           130          256                1
## 901   44   1                2           120          263                0
## 902   52   1                3           172          199                1
## 903   57   1                3           150          168                0
## 904   48   1                2           110          229                0
## 905   54   1                4           140          239                0
## 906   48   0                3           130          275                0
## 907   49   1                2           130          266                0
## 908   64   1                1           110          211                0
## 909   58   0                1           150          283                1
## 910   58   1                2           120          284                0
```

```
## 911   58  1          3      132     224        0
## 912   60  1          4      130     206        0
## 913   50  0          3      120     219        0
## 914   58  0          3      120     340        0
## 915   66  0          1      150     226        0
## 916   43  1          4      150     247        0
## 917   40  1          4      110     167        0
## 918   69  0          1      140     239        0
## 919   60  1          4      117     230        1
## 920   64  1          3      140     335        0
## 921   59  1          4      135     234        0
## 922   44  1          3      130     233        0
## 923   42  1          4      140     226        0
## 924   43  1          4      120     177        0
## 925   57  1          4      150     276        0
## 926   55  1          4      132     353        0
## 927   61  1          3      150     243        1
## 928   65  0          4      150     225        0
## 929   40  1          1      140     199        0
## 930   71  0          2      160     302        0
## 931   59  1          3      150     212        1
## 932   61  0          4      130     330        0
## 933   58  1          3      112     230        0
## 934   51  1          3      110     175        0
## 935   50  1          4      150     243        0
## 936   65  0          3      140     417        1
## 937   53  1          3      130     197        1
## 938   41  0          2      105     198        0
## 939   65  1          4      120     177        0
## 940   44  1          4      112     290        0
## 941   44  1          2      130     219        0
## 942   60  1          4      130     253        0
## 943   54  1          4      124     266        0
## 944   50  1          3      140     233        0
## 945   41  1          4      110     172        0
## 946   54  1          3      125     273        0
## 947   51  1          1      125     213        0
## 948   51  0          4      130     305        0
## 949   46  0          3      142     177        0
## 950   58  1          4      128     216        0
## 951   54  0          3      135     304        1
## 952   54  1          4      120     188        0
## 953   60  1          4      145     282        0
## 954   60  1          3      140     185        0
## 955   54  1          3      150     232        0
## 956   59  1          4      170     326        0
## 957   46  1          3      150     231        0
## 958   65  0          3      155     269        0
## 959   67  1          4      125     254        1
## 960   62  1          4      120     267        0
```

```
## 961   65  1             4         110        248                  0
## 962   44  1             4         110        197                  0
## 963   65  0             3         160        360                  0
## 964   60  1             4         125        258                  0
## 965   51  0             3         140        308                  0
## 966   48  1             2         130        245                  0
## 967   58  1             4         150        270                  0
## 968   45  1             4         104        208                  0
## 969   53  0             4         130        264                  0
## 970   39  1             3         140        321                  0
## 971   68  1             3         180        274                  1
## 972   52  1             2         120        325                  0
## 973   44  1             3         140        235                  0
## 974   47  1             3         138        257                  0
## 975   53  0             3         128        216                  0
## 976   53  0             4         138        234                  0
## 977   51  0             3         130        256                  0
## 978   66  1             4         120        302                  0
## 979   62  0             4         160        164                  0
## 980   62  1             3         130        231                  0
## 981   44  0             3         108        141                  0
## 982   63  0             3         135        252                  0
## 983   52  1             4         128        255                  0
## 984   59  1             4         110        239                  0
## 985   60  0             4         150        258                  0
## 986   52  1             2         134        201                  0
## 987   48  1             4         122        222                  0
## 988   45  1             4         115        260                  0
## 989   34  1             1         118        182                  0
## 990   57  0             4         128        303                  0
## 991   71  0             3         110        265                  1
## 992   49  1             3         120        188                  0
## 993   54  1             2         108        309                  0
## 994   59  1             4         140        177                  0
## 995   57  1             3         128        229                  0
## 996   61  1             4         120        260                  0
## 997   39  1             4         118        219                  0
## 998   61  0             4         145        307                  0
## 999   56  1             4         125        249                  1
## 1000  52  1             1         118        186                  0
## 1001  43  0             4         132        341                  1
## 1002  62  0             3         130        263                  0
## 1003  41  1             2         135        203                  0
## 1004  58  1             3         140        211                  1
## 1005  35  0             4         138        183                  0
## 1006  63  1             4         130        330                  1
## 1007  65  1             4         135        254                  0
## 1008  48  1             4         130        256                  1
## 1009  63  0             4         150        407                  0
## 1010  51  1             3         100        222                  0
```

```
## 1011  55   1                  4             140            217                        0
## 1012  65   1                  1             138            282                        1
## 1013  45   0                  2             130            234                        0
## 1014  56   0                  4             200            288                        1
## 1015  54   1                  4             110            239                        0
## 1016  44   1                  2             120            220                        0
## 1017  62   0                  4             124            209                        0
## 1018  54   1                  3             120            258                        0
## 1019  51   1                  3              94            227                        0
## 1020  29   1                  2             130            204                        0
## 1021  51   1                  4             140            261                        0
## 1022  43   0                  3             122            213                        0
## 1023  55   0                  2             135            250                        0
## 1024  70   1                  4             145            174                        0
## 1025  62   1                  2             120            281                        0
## 1026  35   1                  4             120            198                        0
## 1027  51   1                  3             125            245                        1
## 1028  59   1                  2             140            221                        0
## 1029  59   1                  1             170            288                        0
## 1030  52   1                  2             128            205                        1
## 1031  64   1                  3             125            309                        0
## 1032  58   1                  3             105            240                        0
## 1033  47   1                  3             108            243                        0
## 1034  57   1                  4             165            289                        1
## 1035  41   1                  3             112            250                        0
## 1036  45   1                  2             128            308                        0
## 1037  60   0                  3             102            318                        0
## 1038  52   1                  1             152            298                        1
## 1039  42   0                  4             102            265                        0
## 1040  67   0                  3             115            564                        0
## 1041  55   1                  4             160            289                        0
## 1042  64   1                  4             120            246                        0
## 1043  70   1                  4             130            322                        0
## 1044  51   1                  4             140            299                        0
## 1045  58   1                  4             125            300                        0
## 1046  60   1                  4             140            293                        0
## 1047  68   1                  3             118            277                        0
## 1048  46   1                  2             101            197                        1
## 1049  77   1                  4             125            304                        0
## 1050  54   0                  3             110            214                        0
## 1051  58   0                  4             100            248                        0
## 1052  48   1                  3             124            255                        1
## 1053  57   1                  4             132            207                        0
## 1054  52   1                  3             138            223                        0
## 1055  54   0                  2             132            288                        1
## 1056  35   1                  4             126            282                        0
## 1057  45   0                  2             112            160                        0
## 1058  70   1                  3             160            269                        0
## 1059  53   1                  4             142            226                        0
## 1060  59   0                  4             174            249                        0
```

```
## 1061  62   0                4           140          394                  0
## 1062  64   1                4           145          212                  0
## 1063  57   1                4           152          274                  0
## 1064  52   1                4           108          233                  1
## 1065  56   1                4           132          184                  0
## 1066  43   1                3           130          315                  0
## 1067  53   1                3           130          246                  1
## 1068  48   1                4           124          274                  0
## 1069  56   0                4           134          409                  0
## 1070  42   1                1           148          244                  0
## 1071  59   1                1           178          270                  0
## 1072  60   0                4           158          305                  0
## 1073  63   0                2           140          195                  0
## 1074  42   1                3           120          240                  1
## 1075  66   1                2           160          246                  0
## 1076  54   1                2           192          283                  0
## 1077  69   1                3           140          254                  0
## 1078  50   1                3           129          196                  0
## 1079  51   1                4           140          298                  0
## 1080  43   1                4           132          247                  1
## 1081  62   0                4           138          294                  1
## 1082  68   0                3           120          211                  0
## 1083  67   1                4           100          299                  0
## 1084  69   1                1           160          234                  1
## 1085  45   0                4           138          236                  0
## 1086  50   0                2           120          244                  0
## 1087  59   1                1           160          273                  0
## 1088  50   0                4           110          254                  0
## 1089  64   0                4           180          325                  0
## 1090  57   1                3           150          126                  1
## 1091  64   0                3           140          313                  0
## 1092  43   1                4           110          211                  0
## 1093  45   1                4           142          309                  0
## 1094  58   1                4           128          259                  0
## 1095  50   1                4           144          200                  0
## 1096  55   1                2           130          262                  0
## 1097  62   0                4           150          244                  0
## 1098  37   0                3           120          215                  0
## 1099  38   1                1           120          231                  0
## 1100  41   1                3           130          214                  0
## 1101  66   0                4           178          228                  1
## 1102  52   1                4           112          230                  0
## 1103  56   1                1           120          193                  0
## 1104  46   0                2           105          204                  0
## 1105  46   0                4           138          243                  0
## 1106  64   0                4           130          303                  0
## 1107  59   1                4           138          271                  0
## 1108  41   0                3           112          268                  0
## 1109  54   0                3           108          267                  0
## 1110  39   0                3            94          199                  0
```

```
## 1111  53   1               4        123        282                 0
## 1112  63   0               4        108        269                 0
## 1113  34   0               2        118        210                 0
## 1114  47   1               4        112        204                 0
## 1115  67   0               3        152        277                 0
## 1116  54   1               4        110        206                 0
## 1117  66   1               4        112        212                 0
## 1118  52   0               3        136        196                 0
## 1119  55   0               4        180        327                 0
## 1120  49   1               3        118        149                 0
## 1121  74   0               2        120        269                 0
## 1122  54   0               3        160        201                 0
## 1123  54   1               4        122        286                 0
## 1124  56   1               4        130        283                 1
## 1125  46   1               4        120        249                 0
## 1126  49   0               2        134        271                 0
## 1127  42   1               2        120        295                 0
## 1128  41   1               2        110        235                 0
## 1129  41   0               2        126        306                 0
## 1130  49   0               4        130        269                 0
## 1131  61   1               1        134        234                 0
## 1132  60   0               3        120        178                 1
## 1133  67   1               4        120        237                 0
## 1134  58   1               4        100        234                 0
## 1135  47   1               4        110        275                 0
## 1136  52   1               4        125        212                 0
## 1137  62   1               2        128        208                 1
## 1138  57   1               4        110        201                 0
## 1139  58   1               4        146        218                 0
## 1140  64   1               4        128        263                 0
## 1141  51   0               3        120        295                 0
## 1142  43   1               4        115        303                 0
## 1143  42   0               3        120        209                 0
## 1144  67   0               4        106        223                 0
## 1145  76   0               3        140        197                 0
## 1146  70   1               2        156        245                 0
## 1147  57   1               2        124        261                 0
## 1148  44   0               3        118        242                 0
## 1149  58   0               2        136        319                 1
## 1150  60   0               1        150        240                 0
## 1151  44   1               3        120        226                 0
## 1152  61   1               4        138        166                 0
## 1153  42   1               4        136        315                 0
## 1154  52   1               4        128        204                 1
## 1155  59   1               3        126        218                 1
## 1156  40   1               4        152        223                 0
## 1157  42   1               3        130        180                 0
## 1158  61   1               4        140        207                 0
## 1159  66   1               4        160        228                 0
## 1160  46   1               4        140        311                 0
```

```
## 1161  71   0               4          112         149                   0
## 1162  59   1               1          134         204                   0
## 1163  64   1               1          170         227                   0
## 1164  66   0               3          146         278                   0
## 1165  39   0               3          138         220                   0
## 1166  57   1               2          154         232                   0
## 1167  58   0               4          130         197                   0
## 1168  57   1               4          110         335                   0
## 1169  47   1               3          130         253                   0
## 1170  55   0               4          128         205                   0
## 1171  35   1               2          122         192                   0
## 1172  61   1               4          148         203                   0
## 1173  58   1               4          114         318                   0
## 1174  58   0               4          170         225                   1
## 1175  58   1               2          125         220                   0
## 1176  56   1               2          130         221                   0
## 1177  56   1               2          120         240                   0
## 1178  67   1               3          152         212                   0
## 1179  55   0               2          132         342                   0
## 1180  44   1               4          120         169                   0
## 1181  63   1               4          140         187                   0
## 1182  63   0               4          124         197                   0
## 1183  41   1               2          120         157                   0
## 1184  59   1               4          164         176                   1
## 1185  57   0               4          140         241                   0
## 1186  45   1               1          110         264                   0
## 1187  68   1               4          144         193                   1
## 1188  57   1               4          130         131                   0
## 1189  57   0               2          130         236                   0
## 1190  38   1               3          138         175                   0
##       resting.ecg max.heart.rate exercise.angina oldpeak ST.slope target
## 1               0            172               0     0.0        1      0
## 2               0            156               0     1.0        2      1
## 3               1             98               0     0.0        1      0
## 4               0            108               1     1.5        2      1
## 5               0            122               0     0.0        1      0
## 6               0            170               0     0.0        1      0
## 7               0            170               0     0.0        1      0
## 8               0            142               0     0.0        1      0
## 9               0            130               1     1.5        2      1
## 10              0            120               0     0.0        1      0
## 11              0            142               0     0.0        1      0
## 12              1             99               1     2.0        2      1
## 13              0            145               0     0.0        1      0
## 14              0            140               1     1.0        2      1
## 15              1            137               0     0.0        1      0
## 16              0            150               0     1.5        2      0
## 17              0            166               0     0.0        2      1
## 18              0            165               0     0.0        1      0
## 19              0            125               0     1.0        2      1
```

```
## 20          0          160          0     3.0       2      1
## 21          0          142          0     0.0       1      0
## 22          0          142          0     1.0       2      0
## 23          0          164          0     0.0       1      0
## 24          0          150          1     3.0       2      1
## 25          0          138          0     0.0       1      0
## 26          0          178          0     0.0       1      0
## 27          1          112          1     3.0       2      0
## 28          0          118          0     0.0       1      0
## 29          0          127          0     0.0       1      0
## 30          0          145          0     0.0       1      0
## 31          0          130          0     0.0       2      1
## 32          0          114          0     0.0       1      0
## 33          0          122          0     2.0       2      1
## 34          1          130          0     2.0       2      1
## 35          0          154          0     0.0       1      0
## 36          0          155          0     0.0       1      0
## 37          0           87          1     1.5       2      1
## 38          1          142          0     0.0       1      0
## 39          1          148          0     0.0       1      0
## 40          0          130          1     1.0       2      0
## 41          0          130          0     0.0       1      0
## 42          1          100          1     0.0       2      1
## 43          0          168          0     0.0       1      0
## 44          1          170          0     0.0       1      0
## 45          0          120          1     1.0       2      1
## 46          0          120          1     1.0       2      0
## 47          0          168          0     0.0       1      0
## 48          0          170          0     0.0       1      0
## 49          0          184          0     1.0       2      0
## 50          0          170          0     0.0       2      1
## 51          0          121          1     2.0       2      1
## 52          0           98          1     2.0       2      1
## 53          0          122          0     0.0       1      0
## 54          0          150          0     0.0       1      0
## 55          0          140          1     1.5       2      0
## 56          0          170          0     0.0       1      0
## 57          0          153          1     1.5       2      1
## 58          1          140          0     0.0       2      1
## 59          1          134          0     1.0       1      0
## 60          1           96          1     1.0       2      1
## 61          0          174          0     0.0       1      0
## 62          0          175          0     0.0       1      0
## 63          0          144          0     0.0       1      0
## 64          0          125          1     1.0       2      1
## 65          0          145          0     0.0       1      0
## 66          0          130          0     0.0       1      0
## 67          0          144          0     0.0       1      0
## 68          0          184          0     0.0       1      0
## 69          1           82          1     4.0       2      1
```

```
## 70              0            170                0      0.0          1      0
## 71              1            145                1      1.0          2      1
## 72              0            135                0      0.0          1      0
## 73              0            150                0      0.0          2      1
## 74              1            115                0      0.0          1      0
## 75              0            128                1      1.5          2      1
## 76              0            116                0      0.0          1      0
## 77              0            130                0      0.0          2      1
## 78              0            150                0      0.0          1      0
## 79              0            138                1      0.0          1      0
## 80              0            170                0      0.0          2      1
## 81              0            160                0      0.0          1      0
## 82              0            154                0      0.0          1      0
## 83              0            115                0      0.0          2      1
## 84              0            165                0      0.0          1      0
## 85              0            125                1      1.0          2      1
## 86              0             94                1      1.0          2      1
## 87              0            112                1      2.0          2      1
## 88              0            142                1      2.0          2      0
## 89              1            155                0      0.0          2      1
## 90              0            110                1      0.5          2      0
## 91              0            160                0      0.0          1      0
## 92              0            140                0      0.0          1      0
## 93              0            148                0      0.0          1      0
## 94              0             92                1      1.5          2      1
## 95              1            180                0      0.0          1      0
## 96              0            140                1      2.0          2      1
## 97              0            138                0      0.0          1      0
## 98              0            160                0      0.0          1      0
## 99              0            140                0      0.0          1      0
## 100             0            144                0      0.0          1      0
## 101             1            115                1      1.0          2      1
## 102             0            100                0      0.0          1      0
## 103             0            130                0      2.0          2      1
## 104             0            152                1      1.0          2      1
## 105             0            124                0      0.0          2      1
## 106             0            140                0      0.0          1      0
## 107             1            110                0      0.0          1      0
## 108             1            168                0      0.0          1      0
## 109             0            135                0      0.0          1      0
## 110             0            106                0      0.0          1      0
## 111             0            124                0      1.0          2      0
## 112             0             92                1      3.0          2      1
## 113             0            125                1      0.0          1      0
## 114             0            150                0      0.0          1      0
## 115             1            135                0      0.0          1      0
## 116             0            150                1      1.0          2      1
## 117             0            170                0      0.0          2      1
## 118             1            130                1      1.5          2      1
## 119             1            185                0      0.0          1      0
```

```
## 120          0          180          0     0.0          2       1
## 121          0          170          0     0.0          2       1
## 122          0          139          0     0.0          1       0
## 123          1          140          0     0.0          1       0
## 124          0          110          1     1.0          2       1
## 125          0          150          0     0.0          1       0
## 126          0          110          0     0.0          1       0
## 127          0          190          0     0.0          1       0
## 128          0          175          0     2.0          1       0
## 129          0          140          0     0.0          1       0
## 130          0          152          1     1.5          2       0
## 131          0          130          0     0.0          1       0
## 132          0          150          1     0.0          2       1
## 133          1          122          1     2.0          2       1
## 134          1          124          1     1.5          2       1
## 135          1          120          1     1.0          2       0
## 136          0          175          0     0.0          2       1
## 137          1          175          0     0.0          1       0
## 138          1          146          0     2.0          1       0
## 139          0          118          1     0.0          2       1
## 140          0          130          1     2.0          2       1
## 141          0           94          1     2.5          2       1
## 142          1          125          1     2.5          2       1
## 143          1          158          1     3.0          2       1
## 144          0          155          0     0.0          1       0
## 145          0          150          0     1.0          2       1
## 146          0          132          0     0.0          1       0
## 147          0          155          0     0.0          1       0
## 148          1          176          0     0.0          1       0
## 149          0          160          0     0.0          1       0
## 150          0          125          1     1.0          2       1
## 151          0          120          0     0.0          1       0
## 152          0          100          0     0.0          1       0
## 153          0          150          0     0.0          1       0
## 154          0          140          0     0.0          1       0
## 155          1          160          0     0.0          1       0
## 156          0          150          1     3.0          2       1
## 157          0          150          1     1.0          2       1
## 158          0          130          0     0.0          1       0
## 159          0          100          1     2.0          2       1
## 160          1          130          0     1.0          1       0
## 161          2          119          1     0.0          2       1
## 162          0           96          1     0.0          2       1
## 163          0          174          0     0.0          1       0
## 164          0          160          0     0.0          1       0
## 165          0          150          0     0.0          1       0
## 166          0          140          0     0.0          1       0
## 167          0          175          0     2.0          2       1
## 168          1          140          1     5.0          2       1
## 169          0          118          0     0.0          1       0
```

```
## 170            0            100             0     0.0         1       0
## 171            0            160             0     0.0         1       0
## 172            0            160             0     0.0         1       0
## 173            0            188             0     0.0         1       0
## 174            0            162             0     0.0         1       0
## 175            0            172             0     0.0         1       0
## 176            0            134             1     2.0         2       1
## 177            0            135             1     2.0         2       1
## 178            0            105             0     1.5         2       1
## 179            0            150             0     0.0         1       0
## 180            0            150             0     0.0         1       0
## 181            0             90             0     0.0         1       0
## 182            0            120             1     2.0         2       1
## 183            0            150             0     0.0         1       0
## 184            0            124             1     2.0         2       1
## 185            1            140             1     1.0         2       0
## 186            0            130             0     0.0         1       0
## 187            1             92             0     0.0         2       1
## 188            0            110             0     0.0         1       0
## 189            0            138             1     1.0         2       1
## 190            0            110             1     1.0         2       0
## 191            1            120             1     1.5         2       1
## 192            1            120             0     0.0         1       0
## 193            1            116             0     0.0         1       0
## 194            0            160             0     0.0         1       0
## 195            0            110             0     0.0         1       0
## 196            0            180             0     0.0         1       0
## 197            0            116             0     0.0         1       0
## 198            0            132             0     1.0         2       0
## 199            0            136             0     0.0         1       0
## 200            0            116             1     0.0         2       1
## 201            0             98             0     1.0         2       0
## 202            0            150             0     0.0         1       0
## 203            0            150             0     0.0         1       0
## 204            0            146             0     0.0         1       0
## 205            1            150             0     0.0         1       0
## 206            0            100             0     0.0         1       0
## 207            0            140             1     0.0         1       0
## 208            2            180             0     0.0         1       0
## 209            0            140             0     0.0         2       1
## 210            2            185             0     0.0         1       0
## 211            0            140             0     0.0         2       1
## 212            0            110             0     0.0         2       1
## 213            0            140             1     0.0         2       1
## 214            0            128             1     1.0         1       0
## 215            1            164             0     0.0         1       0
## 216            0             98             1     1.5         2       1
## 217            1            170             0     0.0         1       0
## 218            0            150             0     0.0         2       1
## 219            0            137             0     0.0         1       0
```

```
## 220           0        150          0     0.0     1     0
## 221           0        170          0     0.0     1     0
## 222           0        112          0     0.0     2     1
## 223           0        150          1     1.0     2     1
## 224           0        125          0     0.0     1     0
## 225           0        185          0     0.0     1     0
## 226           0        137          0     0.0     1     0
## 227           0        150          0     0.0     2     1
## 228           0        140          0     0.0     1     0
## 229           0        134          1     2.5     2     1
## 230           0        170          0     0.0     1     0
## 231           1        184          0     0.0     1     0
## 232           0        158          0     0.0     1     0
## 233           0        167          0     0.0     1     0
## 234           0        129          0     0.0     1     0
## 235           0        142          0     0.0     1     0
## 236           1        140          0     0.0     1     0
## 237           0        160          1     1.0     2     0
## 238           0        118          1     3.0     2     1
## 239           0        136          0     0.0     2     1
## 240           0         99          1     2.0     2     1
## 241           0        102          1     3.0     2     1
## 242           0        155          0     0.0     1     0
## 243           0        142          1     2.0     2     1
## 244           0        143          1     2.0     2     1
## 245           0        118          0     0.0     1     0
## 246           0        103          1     1.0     2     1
## 247           0        137          0     2.0     1     0
## 248           0        150          1     1.5     2     1
## 249           1        150          1     2.0     3     1
## 250           1        130          1     1.0     2     1
## 251           0        120          1     1.0     2     1
## 252           0        135          0     0.0     2     1
## 253           0        115          0     2.0     2     1
## 254           1        115          1     0.0     1     0
## 255           0        152          0     1.0     1     0
## 256           0         96          1     2.0     2     1
## 257           0        130          0     0.0     1     0
## 258           2        150          0     0.0     1     0
## 259           0        172          0     0.0     1     0
## 260           0        120          0     0.5     1     0
## 261           0        155          0     0.0     1     0
## 262           0        165          1     0.0     1     0
## 263           0        138          0     1.0     1     0
## 264           0        115          1     0.0     2     1
## 265           0        125          0     0.0     2     1
## 266           0        145          1     1.0     2     1
## 267           0        175          0     0.0     1     0
## 268           0        110          1     1.0     2     1
## 269           0        150          0     0.0     1     0
```

```
## 270                  0              91               1      1.0           2       1
## 271                  0             145               0      2.0           2       0
## 272                  0             140               0      0.0           1       0
## 273                  0             165               0      0.0           1       0
## 274                  0             130               1      3.0           2       1
## 275                  2             134               0      0.0           1       0
## 276                  0             180               0      0.0           1       0
## 277                  0             100               0      0.0           1       0
## 278                  0             150               0      2.0           2       1
## 279                  0             126               1      1.5           2       1
## 280                  1             126               1      0.8           2       0
## 281                  1             155               0      0.0           1       0
## 282                  2             135               0      0.0           1       0
## 283                  0             122               0      2.0           2       1
## 284                  0             160               1      2.0           1       0
## 285                  1             160               0      0.0           1       0
## 286                  0             170               0      0.0           1       0
## 287                  0             120               0      0.0           1       0
## 288                  0             140               0      0.0           1       0
## 289                  0             132               0      0.0           1       0
## 290                  1             156               0      2.0           1       0
## 291                  0             180               0      0.0           1       0
## 292                  0             138               0      0.0           1       0
## 293                  0             135               0      1.0           1       0
## 294                  0             148               0      0.0           1       0
## 418                  1             112               1      3.0           2       1
## 419                  1             127               0      0.0           1       0
## 420                  1             140               1      1.5           3       1
## 421                  1             149               1      2.5           1       1
## 422                  2              99               1      1.3           2       0
## 424                  1             105               1      0.0           2       1
## 427                  1             157               0      0.5           2       1
## 428                  1             140               0      0.0           1       0
## 433                  1              86               0      0.0           1       0
## 434                  0              84               1      2.5           3       1
## 435                  0             125               1      2.0           2       1
## 445                  1             140               1      0.5           2       1
## 446                  0             120               1      1.5           2       1
## 447                  1             124               1      1.6           2       1
## 449                  1             110               1      2.0           1       1
## 450                  0             105               1      1.0           2       1
## 454                  1             118               1      1.5           2       1
## 456                  0             123               1      1.2           2       1
## 462                  1             118               1      1.9           2       1
## 464                  0             117               1      1.3           3       1
## 467                  0             160               0      0.0           1       0
## 470                  1              97               1      1.6           1       1
## 471                  0             161               0      2.0           2       0
## 475                  1             122               1      1.7           2       1
## 478                  2             139               0      0.1           1       0
```

```
## 480                  1             148                1     2.0         2       1
## 484                  0             125                0     2.5         1       1
## 487                  1             128                1     1.2         2       1
## 488                  1             180                0     0.4         1       0
## 489                  1             144                1     2.0         2       1
## 490                  0             135                0     0.3         1       0
## 491                  0             140                1     3.0         2       1
## 492                  0             102                1     1.0         2       1
## 493                  1             108                0     0.0         2       1
## 495                  0             127                1     1.7         2       1
## 496                  0             110                1     2.5         2       1
## 497                  0             140                1     1.0         2       1
## 498                  0              69                0     1.0         3       0
## 499                  0             148                1     3.0         3       1
## 500                  1             130                1     0.0         2       1
## 501                  0             130                1     1.0         2       1
## 502                  0             140                1     4.0         3       1
## 503                  0             138                1     2.0         2       1
## 504                  1             140                1     2.0         2       1
## 505                  1             138                0     0.2         1       0
## 506                  0             112                1     3.0         3       1
## 507                  1             131                1     1.2         2       1
## 508                  0             112                1     3.0         2       1
## 509                  0              80                1     0.0         1       0
## 511                  0             110                0     0.0         2       1
## 512                  0             126                0     0.3         1       0
## 513                  1              88                1     2.0         2       1
## 514                  1             153                0    -0.1         1       0
## 515                  1             150                1     1.3         2       1
## 518                  0             132                0     0.0         0       1
## 519                  0             120                1     1.5         2       1
## 521                  1             121                1     1.0         1       1
## 522                  1             128                0     0.5         2       0
## 523                  1             135                1     4.0         3       1
## 524                  2             120                1     1.0         1       1
## 525                  0             117                1     1.0         2       1
## 526                  1             150                0     0.0         1       0
## 527                  0             144                0     0.1         1       0
## 528                  2             113                1     1.7         2       1
## 529                  0             135                0     0.3         1       0
## 530                  0             127                1     1.5         2       1
## 531                  0             109                1     1.4         2       1
## 532                  0             128                1     1.1         2       1
## 533                  1             115                1     1.8         2       1
## 534                  1             102                0     0.0         2       1
## 535                  1             140                1     2.0         2       1
## 536                  0             135                1     2.5         3       1
## 539                  1             130                1     4.0         3       1
## 540                  0             112                1     2.0         2       1
## 541                  2             100                0     0.0         1       0
```

```
## 542                  1           122                  1      1.2          2       1
## 543                  2           120                  0      3.5          3       1
## 544                  0           105                  1      1.5          2       1
## 545                  1           129                  1      3.0          3       1
## 546                  0           120                  1      0.0          1       0
## 547                  1           139                  0      0.2          1       0
## 548                  1           162                  0      0.0          2       1
## 549                  1           100                  0      1.5          3       1
## 550                  0           140                  0      1.5          1       1
## 551                  1           135                  0      0.2          1       0
## 552                  0            73                  0      2.0          2       1
## 553                  2            86                  0      0.0          1       0
## 554                  0           108                  1      1.8          2       1
## 555                  0           116                  1      1.8          2       1
## 556                  1           160                  0      0.3          1       0
## 557                  1           118                  1      0.0          2       1
## 558                  0           112                  1      2.0          3       0
## 559                  1           122                  1      1.8          2       1
## 560                  1           124                  1      1.4          2       1
## 561                  0           102                  1      4.0          3       1
## 562                  1           137                  0      0.2          1       0
## 563                  1           141                  0      0.1          1       0
## 564                  0           154                  1      2.0          2       0
## 565                  1           126                  1      1.1          2       1
## 566                  1           160                  1      2.0          2       1
## 567                  1           115                  1      1.7          2       1
## 568                  0           128                  1      1.5          2       0
## 569                  1           115                  1      0.0          2       1
## 570                  0           105                  1      1.5          3       1
## 571                  0           110                  1      2.5          2       1
## 572                  1           119                  1      2.0          3       1
## 573                  0           109                  1      1.5          2       1
## 574                  1           135                  1      0.5          2       1
## 575                  2           130                  0      1.5          2       1
## 576                  1           112                  1      1.5          2       1
## 577                  0           126                  1      1.2          2       1
## 578                  1           120                  1      3.0          2       1
## 579                  0           110                  1      1.9          2       1
## 580                  2           119                  1      3.0          3       1
## 581                  1           110                  1      1.8          2       1
## 582                  2           130                  1      1.0          2       1
## 583                  0           159                  1      1.5          1       1
## 584                  2            84                  1      0.0          2       1
## 585                  2           126                  0      0.3          1       0
## 586                  1           116                  1      1.5          2       1
## 587                  1           120                  0      0.8          2       1
## 588                  0           122                  1      2.0          2       1
## 589                  2           165                  0      1.0          2       0
## 590                  1           122                  1      2.0          2       1
## 591                  0            94                  0      0.0          2       1
```

```
## 592                 1             133                 0      0.2           1       0
## 593                 1             110                 0      0.0           1       0
## 594                 2             150                 1      2.0           3       1
## 595                 2             130                 0      0.0           2       1
## 596                 2             113                 1      1.0           1       1
## 597                 2             140                 1      0.5           2       1
## 598                 2             100                 0      0.0           2       1
## 599                 1             136                 0      0.2           1       0
## 600                 2             127                 1      1.7           3       1
## 601                 0              98                 0      1.5           2       1
## 602                 1              96                 1      1.0           2       0
## 603                 0             123                 1      1.3           2       1
## 604                 0              98                 1      0.0           2       1
## 605                 1             118                 1      0.0           2       1
## 606                 0             112                 1      1.5           3       1
## 607                 0             151                 1      0.0           1       0
## 608                 2              96                 0      1.0           1       0
## 609                 1             108                 1      3.0           2       1
## 610                 1             128                 1      1.5           2       1
## 611                 1             138                 1      0.0           2       1
## 612                 0             126                 0      0.0           2       1
## 613                 1             154                 0      0.0           2       1
## 614                 1             137                 0      0.2           1       0
## 615                 1             100                 0      0.0           2       1
## 616                 2             135                 0      0.3           1       0
## 617                 2              93                 1      0.0           2       1
## 618                 2             109                 0      2.4           2       1
## 619                 2             160                 0      1.6           2       0
## 620                 0             141                 0      0.3           1       1
## 621                 0             105                 1      0.2           2       0
## 622                 2             121                 1      0.2           1       0
## 623                 0             140                 0      0.4           1       0
## 624                 2             142                 1      0.6           2       1
## 625                 2             142                 1      1.2           2       1
## 626                 2             170                 0      1.2           2       1
## 627                 2             154                 0      4.0           2       1
## 628                 0             161                 0      0.5           2       0
## 629                 2             111                 1      0.0           1       0
## 630                 2             180                 0      0.0           1       0
## 631                 0             145                 0      2.6           2       1
## 632                 2             159                 0      0.0           1       0
## 633                 0             125                 0      1.6           2       0
## 634                 0             120                 1      1.8           2       1
## 635                 2             155                 1      3.1           3       1
## 636                 2             144                 1      1.8           2       0
## 637                 0             178                 1      1.4           1       0
## 638                 2             129                 1      2.6           2       1
## 639                 2             180                 0      0.2           2       0
## 640                 0             181                 0      1.2           2       0
## 641                 0             143                 0      0.1           1       0
```

```
## 642             2            159               1     0.0         1      0
## 643             0            139               0     0.2         1      0
## 644             2            152               1     0.0         2      0
## 645             2            157               0     0.6         1      0
## 646             2            165               0     2.5         2      1
## 647             2            130               0     0.0         1      0
## 648             2            150               0     0.4         2      1
## 649             2            138               0     2.3         1      0
## 650             0            170               0     0.0         1      0
## 651             2            140               1     3.4         3      1
## 652             2            126               1     0.9         2      1
## 653             2            150               1     0.0         1      1
## 654             2            138               1     1.9         1      1
## 655             2            125               0     0.0         1      1
## 656             0            150               0     0.0         1      0
## 657             2            186               0     0.0         1      0
## 658             0            181               0     0.0         1      1
## 659             0            163               0     0.0         1      0
## 660             0            179               1     0.4         1      0
## 661             0            156               0     0.0         1      0
## 662             0            134               0     2.2         2      1
## 663             2            165               0     0.0         1      0
## 664             2            126               0     0.8         1      1
## 665             2            177               0     0.0         1      1
## 666             0            120               1     0.0         2      1
## 667             2            114               0     1.0         2      1
## 668             0            125               1     1.8         2      1
## 669             0            184               0     0.0         1      0
## 670             2            157               0     0.8         1      0
## 671             0            179               0     0.0         1      0
## 672             2            175               0     0.6         2      0
## 673             0            168               0     0.0         1      0
## 674             2            125               1     3.6         2      1
## 675             0             96               0     0.0         1      0
## 676             0            143               1     0.0         2      1
## 677             2            103               0     1.4         2      1
## 678             0            173               0     0.2         1      0
## 679             0            142               1     1.2         2      1
## 680             0            169               0     0.0         1      0
## 681             0            171               0     0.9         1      0
## 682             2            150               0     2.3         3      0
## 683             2            112               1     0.6         2      1
## 684             2            186               1     0.0         1      0
## 685             2            152               0     0.0         1      1
## 686             0            149               0     0.3         2      0
## 687             0            152               0     0.0         1      1
## 688             0            140               1     3.6         2      1
## 689             0            163               1     0.6         1      0
## 690             2            143               0     0.0         1      0
## 691             1            116               0     1.1         2      0
```

```
## 692                0             142               0      0.3          1       0
## 693                2             147               1      0.0          2       1
## 694                2             148               1      3.0          2       0
## 695                0             179               0      0.0          1       0
## 696                0             173               0      0.0          2       0
## 697                0             178               0      0.8          1       0
## 698                0             105               0      2.0          2       1
## 699                0             130               1      1.6          2       1
## 700                2             111               1      0.8          1       1
## 701                2             168               0      2.0          2       0
## 702                0             126               1      1.5          2       0
## 703                2             178               0      0.8          1       0
## 704                2             140               0      0.0          1       0
## 705                2             145               0      4.2          3       0
## 706                0             163               0      0.0          1       0
## 707                2             128               0      2.6          2       1
## 708                0             164               1      0.0          1       0
## 709                2             169               0      0.0          1       1
## 710                2             109               1      2.2          2       1
## 711                2             108               1      0.0          2       1
## 712                0             168               0      1.0          1       1
## 713                2             118               1      1.0          2       1
## 714                2             151               0      0.4          2       0
## 715                0             156               0      0.1          1       1
## 716                0             133               0      0.2          1       0
## 717                0             162               0      1.1          1       0
## 718                0             175               0      0.6          2       0
## 719                0              71               0      1.0          2       1
## 720                0             163               0      0.0          1       0
## 721                2             124               0      1.0          2       1
## 722                2             147               0      1.4          2       1
## 723                2             166               0      0.5          2       1
## 724                0             143               1      1.2          2       0
## 725                2             157               0      2.6          2       1
## 726                0             162               1      0.0          1       1
## 727                0             138               0      0.0          2       0
## 728                1             117               1      3.4          2       1
## 729                0             153               0      0.0          1       0
## 730                2             161               0      0.0          1       1
## 731                0             170               0      0.0          1       0
## 732                0             162               0      0.0          1       0
## 733                0             162               0      0.0          2       0
## 734                2             144               0      0.8          1       1
## 735                2             133               1      4.0          3       1
## 736                0             114               0      2.6          3       0
## 737                2             103               1      1.6          3       1
## 738                0             139               0      2.0          2       1
## 739                2             116               1      3.2          2       1
## 740                0              88               1      1.2          2       1
## 741                2             151               0      0.8          1       0
```

```
## 742                 2            152                  0      0.5          3       0
## 743                 0            163                  0      0.0          1       0
## 744                 0             99                  1      1.8          2       1
## 745                 2            169                  0      0.1          2       0
## 746                 0            158                  0      0.8          1       0
## 747                 0            160                  1      1.4          1       1
## 748                 0            169                  1      1.8          2       1
## 749                 2            132                  1      0.1          1       1
## 750                 0            178                  0      0.0          1       0
## 751                 2             96                  1      2.2          3       1
## 752                 2            165                  0      1.6          1       0
## 753                 2            160                  1      1.4          3       0
## 754                 0            172                  0      0.0          1       0
## 755                 2            144                  1      1.2          2       1
## 756                 0            192                  0      0.7          1       0
## 757                 0            168                  1      0.0          1       0
## 758                 2            132                  0      2.0          2       1
## 759                 2            182                  0      0.0          1       0
## 760                 0            163                  0      0.6          2       1
## 761                 2            125                  1      1.4          1       0
## 762                 2            195                  0      0.0          1       1
## 763                 0             95                  1      2.0          2       1
## 764                 0            160                  0      0.0          1       1
## 765                 2            114                  1      2.0          2       1
## 766                 2            173                  0      3.2          1       1
## 767                 2            172                  1      0.0          1       0
## 768                 0            179                  0      0.0          1       0
## 769                 0            158                  0      1.6          2       0
## 770                 2            167                  0      0.0          1       0
## 771                 0            122                  0      2.0          2       0
## 772                 2            149                  0      0.5          1       0
## 773                 0            172                  0      0.0          1       0
## 774                 0            111                  1      5.6          3       1
## 775                 2            170                  0      0.0          1       0
## 776                 2            162                  0      1.9          2       0
## 777                 0            165                  1      1.0          2       1
## 778                 0            182                  1      3.8          2       1
## 779                 0            154                  1      1.4          2       1
## 780                 0            155                  0      0.0          1       0
## 781                 2            130                  1      3.0          2       1
## 782                 0            161                  0      0.0          1       0
## 783                 0            154                  1      0.0          1       0
## 784                 2            159                  0      0.0          1       0
## 785                 2            152                  0      1.2          3       0
## 786                 2            152                  1      0.2          2       0
## 787                 2            174                  0      1.4          2       1
## 788                 2            131                  0      0.1          2       0
## 789                 2            146                  0      2.0          2       1
## 790                 2            125                  1      0.9          2       1
## 791                 2            115                  0      1.5          2       0
```

```
## 792                 2            174                 0      0.0          1       0
## 793                 0            106                 0      1.9          2       1
## 794                 0            122                 1      4.2          2       1
## 795                 0            147                 0      3.6          2       1
## 796                 0            163                 0      0.2          2       1
## 797                 0            163                 0      0.0          1       0
## 798                 0            194                 0      0.8          3       0
## 799                 2            150                 1      1.9          2       1
## 800                 2            158                 0      0.0          1       1
## 801                 2            122                 0      0.6          2       0
## 802                 2            173                 0      0.0          1       0
## 803                 0            162                 0      1.9          1       0
## 804                 2            105                 1      2.1          2       1
## 805                 0            147                 0      0.1          1       0
## 806                 2            157                 0      1.2          2       0
## 807                 0            112                 1      2.9          2       1
## 808                 0            160                 0      1.2          1       0
## 809                 0            125                 1      2.6          3       1
## 810                 0            156                 0      0.0          1       0
## 811                 2            156                 1      0.0          1       1
## 812                 0            175                 0      0.0          1       0
## 813                 2            161                 0      1.4          2       0
## 814                 2            122                 0      1.0          2       0
## 815                 0            158                 0      1.6          2       0
## 816                 0            151                 0      1.8          1       0
## 817                 2            162                 1      0.0          1       1
## 818                 0            151                 0      1.0          1       0
## 819                 2            171                 0      0.0          1       1
## 820                 2            141                 1      2.8          2       1
## 821                 0            173                 1      1.6          1       1
## 822                 2            145                 1      0.8          2       1
## 823                 0            178                 0      1.2          2       0
## 824                 0            160                 0      0.0          1       0
## 825                 2            154                 1      0.6          2       0
## 826                 0            131                 1      1.8          2       1
## 827                 0            187                 0      3.5          3       0
## 828                 2            159                 0      0.2          2       1
## 829                 2            166                 0      2.4          2       0
## 830                 0            165                 0      0.2          2       0
## 831                 2            131                 1      2.2          2       1
## 832                 2            202                 0      0.0          1       0
## 833                 2            172                 0      1.4          1       0
## 834                 2            172                 0      0.0          1       0
## 835                 0            154                 1      0.0          1       0
## 836                 2            147                 0      0.4          2       0
## 837                 0            170                 0      0.0          1       0
## 838                 0            126                 1      2.8          2       1
## 839                 2            127                 0      2.8          2       1
## 840                 0            174                 0      1.6          1       0
## 841                 2            132                 1      1.8          1       1
```

```
## 842              0            182             0      1.4         1      0
## 843              0            132             0      0.0         2      0
## 844              0             97             0      1.2         2      1
## 845              2            136             1      3.0         2      1
## 846              2            162             0      1.0         1      0
## 847              2            190             0      0.0         2      0
## 848              2            146             1      1.0         2      1
## 849              0            140             0      1.2         2      1
## 850              2            185             0      0.0         1      0
## 851              0            161             1      0.0         1      1
## 852              0            146             0      1.8         2      0
## 853              2            145             0      6.2         3      1
## 854              2            160             0      0.0         1      0
## 855              2            120             1      2.5         2      1
## 856              2            156             0      0.0         1      0
## 857              0            172             0      0.2         1      0
## 858              2            150             1      1.6         2      1
## 859              2            182             0      0.0         1      0
## 860              2            143             0      0.4         2      0
## 861              2            160             0      3.6         3      1
## 862              2            142             0      1.5         1      0
## 863              0            144             1      1.4         1      1
## 864              2            158             0      0.6         1      1
## 865              0            148             0      0.8         1      0
## 866              2            155             0      3.0         2      1
## 867              2            142             1      2.8         2      1
## 868              0            113             0      1.4         2      1
## 869              2            188             0      0.0         1      0
## 870              2            153             0      0.0         1      1
## 871              0            123             0      0.6         1      0
## 872              0            157             0      1.6         1      0
## 873              0            162             0      0.4         1      0
## 874              0            137             1      1.0         2      0
## 875              0            132             1      1.2         2      1
## 876              0            158             0      0.0         1      1
## 877              0            171             0      1.5         1      0
## 878              0            172             0      0.0         1      0
## 879              2            132             1      2.4         2      1
## 880              2            160             0      1.8         2      1
## 881              0            171             0      0.6         1      0
## 882              0            168             0      1.0         3      1
## 883              0            162             0      0.5         1      0
## 884              0            173             0      0.0         1      0
## 885              2            153             0      1.3         2      0
## 886              0            148             0      0.4         2      0
## 887              2            108             1      1.5         2      1
## 888              2            150             0      2.3         3      0
## 889              2            108             1      1.5         2      1
## 890              2            129             1      2.6         2      1
## 891              0            187             0      3.5         3      0
```

```
## 892                 2            172                0      1.4          1       0
## 893                 0            178                0      0.8          1       0
## 894                 2            160                0      3.6          3       1
## 895                 0            163                1      0.6          1       0
## 896                 2            147                0      1.4          2       1
## 897                 2            155                1      3.1          3       1
## 898                 0            148                0      0.4          2       0
## 899                 2            153                0      1.3          2       0
## 900                 2            142                1      0.6          2       1
## 901                 0            173                0      0.0          1       0
## 902                 0            162                0      0.5          1       0
## 903                 0            174                0      1.6          1       0
## 904                 0            168                0      1.0          3       1
## 905                 0            160                0      1.2          1       0
## 906                 0            139                0      0.2          1       0
## 907                 0            171                0      0.6          1       0
## 908                 2            144                1      1.8          2       0
## 909                 2            162                0      1.0          1       0
## 910                 2            160                0      1.8          2       1
## 911                 2            173                0      3.2          1       1
## 912                 2            132                1      2.4          2       1
## 913                 0            158                0      1.6          2       0
## 914                 0            172                0      0.0          1       0
## 915                 0            114                0      2.6          3       0
## 916                 0            171                0      1.5          1       0
## 917                 2            114                1      2.0          2       1
## 918                 0            151                0      1.8          1       0
## 919                 0            160                1      1.4          1       1
## 920                 0            158                0      0.0          1       1
## 921                 0            161                0      0.5          2       0
## 922                 0            179                1      0.4          1       0
## 923                 0            178                0      0.0          1       0
## 924                 2            120                1      2.5          2       1
## 925                 2            112                1      0.6          2       1
## 926                 0            132                1      1.2          2       1
## 927                 0            137                1      1.0          2       0
## 928                 2            114                0      1.0          2       1
## 929                 0            178                1      1.4          1       0
## 930                 0            162                0      0.4          1       0
## 931                 0            157                0      1.6          1       0
## 932                 2            169                0      0.0          1       1
## 933                 2            165                0      2.5          2       1
## 934                 0            123                0      0.6          1       0
## 935                 2            128                0      2.6          2       1
## 936                 2            157                0      0.8          1       0
## 937                 2            152                0      1.2          3       0
## 938                 0            168                0      0.0          1       0
## 939                 0            140                0      0.4          1       0
## 940                 2            153                0      0.0          1       1
## 941                 2            188                0      0.0          1       0
```

```
## 942               0            144                 1      1.4           1       1
## 943               2            109                 1      2.2           2       1
## 944               0            163                 0      0.6           2       1
## 945               2            158                 0      0.0           1       1
## 946               2            152                 0      0.5           3       0
## 947               2            125                 1      1.4           1       0
## 948               0            142                 1      1.2           2       1
## 949               2            160                 1      1.4           3       0
## 950               2            131                 1      2.2           2       1
## 951               0            170                 0      0.0           1       0
## 952               0            113                 0      1.4           2       1
## 953               2            142                 1      2.8           2       1
## 954               2            155                 0      3.0           2       1
## 955               2            165                 0      1.6           1       0
## 956               2            140                 1      3.4           3       1
## 957               0            147                 0      3.6           2       1
## 958               0            148                 0      0.8           1       0
## 959               0            163                 0      0.2           2       1
## 960               0             99                 1      1.8           2       1
## 961               2            158                 0      0.6           1       1
## 962               2            177                 0      0.0           1       1
## 963               2            151                 0      0.8           1       0
## 964               2            141                 1      2.8           2       1
## 965               2            142                 0      1.5           1       0
## 966               2            180                 0      0.2           2       0
## 967               2            111                 1      0.8           1       1
## 968               2            148                 1      3.0           2       0
## 969               2            143                 0      0.4           2       0
## 970               2            182                 0      0.0           1       0
## 971               2            150                 1      1.6           2       1
## 972               0            172                 0      0.2           1       0
## 973               2            180                 0      0.0           1       0
## 974               2            156                 0      0.0           1       0
## 975               2            115                 0      0.0           1       0
## 976               2            160                 0      0.0           1       0
## 977               2            149                 0      0.5           1       0
## 978               2            151                 0      0.4           2       0
## 979               2            145                 0      6.2           3       1
## 980               0            146                 0      1.8           2       0
## 981               0            175                 0      0.6           2       0
## 982               2            172                 0      0.0           1       0
## 983               0            161                 1      0.0           1       1
## 984               2            142                 1      1.2           2       1
## 985               2            157                 0      2.6           2       1
## 986               0            158                 0      0.8           1       0
## 987               2            186                 0      0.0           1       0
## 988               2            185                 0      0.0           1       0
## 989               2            174                 0      0.0           1       0
## 990               2            159                 0      0.0           1       0
## 991               2            130                 0      0.0           1       0
```

```
## 992              0           139               0     2.0          2      1
## 993              0           156               0     0.0          1      0
## 994              0           162               1     0.0          1      1
## 995              2           150               0     0.4          2      1
## 996              0           140               1     3.6          2      1
## 997              0           140               0     1.2          2      1
## 998              2           146               1     1.0          2      1
## 999              2           144               1     1.2          2      1
## 1000             2           190               0     0.0          2      0
## 1001             2           136               1     3.0          2      1
## 1002             0            97               0     1.2          2      1
## 1003             0           132               0     0.0          2      0
## 1004             2           165               0     0.0          1      0
## 1005             0           182               0     1.4          1      0
## 1006             2           132               1     1.8          1      1
## 1007             2           127               0     2.8          2      1
## 1008             2           150               1     0.0          1      1
## 1009             2           154               0     4.0          2      1
## 1010             0           143               1     1.2          2      0
## 1011             0           111               1     5.6          3      1
## 1012             2           174               0     1.4          2      1
## 1013             2           175               0     0.6          2      0
## 1014             2           133               1     4.0          3      1
## 1015             0           126               1     2.8          2      1
## 1016             0           170               0     0.0          1      0
## 1017             0           163               0     0.0          1      0
## 1018             2           147               0     0.4          2      0
## 1019             0           154               1     0.0          1      0
## 1020             2           202               0     0.0          1      0
## 1021             2           186               1     0.0          1      0
## 1022             0           165               0     0.2          2      0
## 1023             2           161               0     1.4          2      0
## 1024             0           125               1     2.6          3      1
## 1025             2           103               0     1.4          2      1
## 1026             0           130               1     1.6          2      1
## 1027             2           166               0     2.4          2      0
## 1028             0           164               1     0.0          1      0
## 1029             2           159               0     0.2          2      1
## 1030             0           184               0     0.0          1      0
## 1031             0           131               1     1.8          2      1
## 1032             2           154               1     0.6          2      0
## 1033             0           152               0     0.0          1      1
## 1034             2           124               0     1.0          2      1
## 1035             0           179               0     0.0          1      0
## 1036             2           170               0     0.0          1      0
## 1037             0           160               0     0.0          1      0
## 1038             0           178               0     1.2          2      0
## 1039             2           122               0     0.6          2      0
## 1040             2           160               0     1.6          2      0
## 1041             2           145               1     0.8          2      1
```

```
## 1042             2            96               1      2.2          3       1
## 1043             2           109               0      2.4          2       1
## 1044             0           173               1      1.6          1       1
## 1045             2           171               0      0.0          1       1
## 1046             2           170               0      1.2          2       1
## 1047             0           151               0      1.0          1       0
## 1048             0           156               0      0.0          1       0
## 1049             2           162               1      0.0          1       1
## 1050             0           158               0      1.6          2       0
## 1051             2           122               0      1.0          2       0
## 1052             0           175               0      0.0          1       0
## 1053             0           168               1      0.0          1       0
## 1054             0           169               0      0.0          1       0
## 1055             2           159               1      0.0          1       0
## 1056             2           156               1      0.0          1       1
## 1057             0           138               0      0.0          2       0
## 1058             0           112               1      2.9          2       1
## 1059             2           111               1      0.0          1       0
## 1060             0           143               1      0.0          2       1
## 1061             2           157               0      1.2          2       0
## 1062             2           132               0      2.0          2       1
## 1063             0            88               1      1.2          2       1
## 1064             0           147               0      0.1          1       0
## 1065             2           105               1      2.1          2       1
## 1066             0           162               0      1.9          1       0
## 1067             2           173               0      0.0          1       0
## 1068             2           166               0      0.5          2       1
## 1069             2           150               1      1.9          2       1
## 1070             2           178               0      0.8          1       0
## 1071             2           145               0      4.2          3       0
## 1072             2           161               0      0.0          1       1
## 1073             0           179               0      0.0          1       0
## 1074             0           194               0      0.8          3       0
## 1075             0           120               1      0.0          2       1
## 1076             2           195               0      0.0          1       1
## 1077             2           146               0      2.0          2       1
## 1078             0           163               0      0.0          1       0
## 1079             0           122               1      4.2          2       1
## 1080             2           143               1      0.1          2       1
## 1081             0           106               0      1.9          2       1
## 1082             2           115               0      1.5          2       0
## 1083             2           125               1      0.9          2       1
## 1084             2           131               0      0.1          2       0
## 1085             2           152               1      0.2          2       0
## 1086             0           162               0      1.1          1       0
## 1087             2           125               0      0.0          1       1
## 1088             2           159               0      0.0          1       0
## 1089             0           154               1      0.0          1       0
## 1090             0           173               0      0.2          1       0
## 1091             0           133               0      0.2          1       0
```

```
## 1092            0            161            0      0.0          1       0
## 1093            2            147            1      0.0          2       1
## 1094            2            130            1      3.0          2       1
## 1095            2            126            1      0.9          2       1
## 1096            0            155            0      0.0          1       0
## 1097            0            154            1      1.4          2       1
## 1098            0            170            0      0.0          1       0
## 1099            0            182            1      3.8          2       1
## 1100            2            168            0      2.0          2       0
## 1101            0            165            1      1.0          2       1
## 1102            0            160            0      0.0          1       1
## 1103            2            162            0      1.9          2       0
## 1104            0            172            0      0.0          1       0
## 1105            2            152            1      0.0          2       0
## 1106            0            122            0      2.0          2       0
## 1107            2            182            0      0.0          1       0
## 1108            2            172            1      0.0          1       0
## 1109            2            167            0      0.0          1       0
## 1110            0            179            0      0.0          1       0
## 1111            0             95            1      2.0          2       1
## 1112            0            169            1      1.8          2       1
## 1113            0            192            0      0.7          1       0
## 1114            0            143            0      0.1          1       0
## 1115            0            172            0      0.0          1       0
## 1116            2            108            1      0.0          2       1
## 1117            2            132            1      0.1          1       1
## 1118            2            169            0      0.1          2       0
## 1119            1            117            1      3.4          2       1
## 1120            2            126            0      0.8          1       1
## 1121            2            121            1      0.2          1       0
## 1122            0            163            0      0.0          1       0
## 1123            2            116            1      3.2          2       1
## 1124            2            103            1      1.6          3       1
## 1125            2            144            0      0.8          1       1
## 1126            0            162            0      0.0          2       0
## 1127            0            162            0      0.0          1       0
## 1128            0            153            0      0.0          1       0
## 1129            0            163            0      0.0          1       0
## 1130            0            163            0      0.0          1       0
## 1131            0            145            0      2.6          2       1
## 1132            0             96            0      0.0          1       0
## 1133            0             71            0      1.0          2       1
## 1134            0            156            0      0.1          1       1
## 1135            2            118            1      1.0          2       1
## 1136            0            168            0      1.0          1       1
## 1137            2            140            0      0.0          1       0
## 1138            0            126            1      1.5          2       0
## 1139            0            105            0      2.0          2       1
## 1140            0            105            1      0.2          2       0
## 1141            2            157            0      0.6          1       0
```

```
## 1142             0            181               0     1.2          2      0
## 1143             0            173               0     0.0          2      0
## 1144             0            142               0     0.3          1      0
## 1145             1            116               0     1.1          2      0
## 1146             2            143               0     0.0          1      0
## 1147             0            141               0     0.3          1      1
## 1148             0            149               0     0.3          2      0
## 1149             2            152               0     0.0          1      1
## 1150             0            171               0     0.9          1      0
## 1151             0            169               0     0.0          1      0
## 1152             2            125               1     3.6          2      1
## 1153             0            125               1     1.8          2      1
## 1154             0            156               1     1.0          2      1
## 1155             0            134               0     2.2          2      1
## 1156             0            181               0     0.0          1      1
## 1157             0            150               0     0.0          1      0
## 1158             2            138               1     1.9          1      1
## 1159             2            138               0     2.3          1      0
## 1160             0            120               1     1.8          2      1
## 1161             0            125               0     1.6          2      0
## 1162             0            162               0     0.8          1      1
## 1163             2            155               0     0.6          2      0
## 1164             2            152               0     0.0          2      0
## 1165             0            152               0     0.0          2      0
## 1166             2            164               0     0.0          1      1
## 1167             0            131               0     0.6          2      0
## 1168             0            143               1     3.0          2      1
## 1169             0            179               0     0.0          1      0
## 1170             1            130               1     2.0          2      1
## 1171             0            174               0     0.0          1      0
## 1172             0            161               0     0.0          1      1
## 1173             1            140               0     4.4          3      1
## 1174             2            146               1     2.8          2      1
## 1175             0            144               0     0.4          2      0
## 1176             2            163               0     0.0          1      0
## 1177             0            169               0     0.0          3      0
## 1178             2            150               0     0.8          2      1
## 1179             0            166               0     1.2          1      0
## 1180             0            144               1     2.8          3      1
## 1181             2            144               1     4.0          1      1
## 1182             0            136               1     0.0          2      1
## 1183             0            182               0     0.0          1      0
## 1184             2             90               0     1.0          2      1
## 1185             0            123               1     0.2          2      1
## 1186             0            132               0     1.2          2      1
## 1187             0            141               0     3.4          2      1
## 1188             0            115               1     1.2          2      1
## 1189             2            174               0     0.0          2      1
## 1190             0            173               0     0.0          1      0
```

```
heart_clean[heart_clean$ST.slope >= min(heart_STs_boxplot$out), ]
```

```
##      age sex chest.pain.type resting.bp.s cholesterol fasting.blood.sugar
## 1     40   1               2          140         289                   0
## 2     49   0               3          160         180                   0
## 3     37   1               2          130         283                   0
## 4     48   0               4          138         214                   0
## 5     54   1               3          150         195                   0
## 6     39   1               3          120         339                   0
## 7     45   0               2          130         237                   0
## 8     54   1               2          110         208                   0
## 9     37   1               4          140         207                   0
## 10    48   0               2          120         284                   0
## 11    37   0               3          130         211                   0
## 12    58   1               2          136         164                   0
## 13    39   1               2          120         204                   0
## 14    49   1               4          140         234                   0
## 15    42   0               3          115         211                   0
## 16    54   0               2          120         273                   0
## 17    38   1               4          110         196                   0
## 18    43   0               2          120         201                   0
## 19    60   1               4          100         248                   0
## 20    36   1               2          120         267                   0
## 21    43   0               1          100         223                   0
## 22    44   1               2          120         184                   0
## 23    49   0               2          124         201                   0
## 24    44   1               2          150         288                   0
## 25    40   1               3          130         215                   0
## 26    36   1               3          130         209                   0
## 27    53   1               4          124         260                   0
## 28    52   1               2          120         284                   0
## 29    53   0               2          113         468                   0
## 30    51   1               2          125         188                   0
## 31    53   1               3          145         518                   0
## 32    56   1               3          130         167                   0
## 33    54   1               4          125         224                   0
## 34    41   1               4          130         172                   0
## 35    43   0               2          150         186                   0
## 36    32   1               2          125         254                   0
## 37    65   1               4          140         306                   1
## 38    41   0               2          110         250                   0
## 39    48   0               2          120         177                   1
## 40    48   0               4          150         227                   0
## 41    54   0               2          150         230                   0
## 42    54   0               3          130         294                   0
## 43    35   1               2          150         264                   0
## 44    52   1               3          140         259                   0
## 45    43   1               4          120         175                   0
## 46    59   1               3          130         318                   0
## 47    37   1               4          120         223                   0
```

```
## 48    50   1                2           140          216                 0
## 49    36   1                3           112          340                 0
## 50    41   1                4           110          289                 0
## 51    50   1                4           130          233                 0
## 52    47   0                4           120          205                 0
## 53    45   1                2           140          224                 1
## 54    41   0                2           130          245                 0
## 55    52   0                4           130          180                 0
## 56    51   0                2           160          194                 0
## 57    31   1                4           120          270                 0
## 58    58   1                3           130          213                 0
## 59    54   1                4           150          365                 0
## 60    52   1                4           112          342                 0
## 61    49   1                2           100          253                 0
## 62    43   0                3           150          254                 0
## 63    45   1                4           140          224                 0
## 64    46   1                4           120          277                 0
## 65    50   0                2           110          202                 0
## 66    37   0                2           120          260                 0
## 67    45   0                4           132          297                 0
## 68    32   1                2           110          225                 0
## 69    52   1                4           160          246                 0
## 70    44   1                4           150          412                 0
## 71    57   1                2           140          265                 0
## 72    44   1                2           130          215                 0
## 73    52   1                4           120          182                 0
## 74    44   0                4           120          218                 0
## 75    55   1                4           140          268                 0
## 76    46   1                3           150          163                 0
## 77    32   1                4           118          529                 0
## 78    35   0                4           140          167                 0
## 79    52   1                2           140          100                 0
## 80    49   1                4           130          206                 0
## 81    55   1                3           110          277                 0
## 82    54   1                2           120          238                 0
## 83    63   1                4           150          223                 0
## 84    52   1                2           160          196                 0
## 85    56   1                4           150          213                 1
## 86    66   1                4           140          139                 0
## 87    65   1                4           170          263                 1
## 88    53   0                2           140          216                 0
## 89    43   1                1           120          291                 0
## 90    55   1                4           140          229                 0
## 91    49   0                2           110          208                 0
## 92    39   1                4           130          307                 0
## 93    52   0                2           120          210                 0
## 94    48   1                4           160          329                 0
## 95    39   0                3           110          182                 0
## 96    58   1                4           130          263                 0
## 97    43   1                2           142          207                 0
```

```
## 98     39   1                3           160          147                 1
## 99     56   1                4           120           85                 0
## 100    41   1                2           125          269                 0
## 101    65   1                4           130          275                 0
## 102    51   1                4           130          179                 0
## 103    40   0                4           150          392                 0
## 104    40   1                4           120          466                 1
## 105    46   1                4           118          186                 0
## 106    57   1                2           140          260                 1
## 107    48   0                4           120          254                 0
## 108    34   1                2           150          214                 0
## 109    50   1                4           140          129                 0
## 110    39   1                2           190          241                 0
## 111    59   0                2           130          188                 0
## 112    57   1                4           150          255                 0
## 113    47   1                4           140          276                 1
## 114    38   1                2           140          297                 0
## 115    49   0                3           130          207                 0
## 116    33   0                4           100          246                 0
## 117    38   1                4           120          282                 0
## 118    59   0                4           130          338                 1
## 119    35   0                1           120          160                 0
## 120    34   1                1           140          156                 0
## 121    47   0                3           135          248                 1
## 122    52   0                3           125          272                 0
## 123    46   1                4           110          240                 0
## 124    58   0                2           180          393                 0
## 125    58   1                2           130          230                 0
## 126    54   1                2           120          246                 0
## 127    34   0                2           130          161                 0
## 128    48   0                4           108          163                 0
## 129    54   0                2           120          230                 1
## 130    42   1                3           120          228                 0
## 131    38   1                3           145          292                 0
## 132    46   1                4           110          202                 0
## 133    56   1                4           170          388                 0
## 134    56   1                4           150          230                 0
## 135    61   0                4           130          294                 0
## 136    49   1                3           115          265                 0
## 137    43   0                2           120          215                 0
## 138    39   1                2           120          241                 0
## 139    54   1                4           140          166                 0
## 140    43   1                4           150          247                 0
## 141    52   1                4           160          331                 0
## 142    50   1                4           140          341                 0
## 143    47   1                4           160          291                 0
## 144    53   1                4           140          243                 0
## 145    56   0                2           120          279                 0
## 146    39   1                4           110          273                 0
## 147    42   1                2           120          198                 0
```

```
## 148   43   0                 2           120          249                     0
## 149   50   1                 2           120          168                     0
## 150   54   1                 4           130          603                     1
## 151   39   1                 2           130          215                     0
## 152   48   1                 2           100          159                     0
## 153   40   1                 2           130          275                     0
## 154   55   1                 4           120          270                     0
## 155   41   1                 2           120          291                     0
## 156   56   1                 4           155          342                     1
## 157   38   1                 4           110          190                     0
## 158   49   1                 4           140          185                     0
## 159   44   1                 4           130          290                     0
## 160   54   1                 2           160          195                     0
## 161   59   1                 4           140          264                     1
## 162   49   1                 4           128          212                     0
## 163   47   1                 2           160          263                     0
## 164   49   0                 2           110          208                     0
## 165   42   1                 2           120          196                     0
## 166   52   0                 2           140          225                     0
## 167   46   1                 1           140          272                     1
## 168   50   1                 4           140          231                     0
## 169   48   1                 2           140          238                     0
## 170   58   1                 4           135          222                     0
## 171   58   1                 3           140          179                     0
## 172   29   1                 2           120          243                     0
## 173   40   1                 3           140          235                     0
## 174   53   1                 2           140          320                     0
## 175   49   1                 3           140          187                     0
## 176   52   1                 4           140          266                     0
## 177   43   1                 4           140          288                     0
## 178   54   1                 4           140          216                     0
## 179   59   1                 2           140          287                     0
## 180   37   1                 3           130          194                     0
## 181   46   0                 4           130          238                     0
## 182   52   1                 4           130          225                     0
## 183   51   1                 2           130          224                     0
## 184   52   1                 4           140          404                     0
## 185   46   1                 4           110          238                     0
## 186   54   0                 2           160          312                     0
## 187   58   1                 3           160          211                     1
## 188   58   1                 2           130          251                     0
## 189   41   1                 4           120          237                     1
## 190   50   0                 4           120          328                     0
## 191   53   1                 4           180          285                     0
## 192   46   1                 4           180          280                     0
## 193   50   1                 2           170          209                     0
## 194   48   1                 2           130          245                     0
## 195   45   1                 3           135          192                     0
## 196   41   0                 2           125          184                     0
## 197   62   0                 1           160          193                     0
```

```
## 198   49   1                   4            120            297                       0
## 199   42   1                   2            150            268                       0
## 200   53   1                   4            120            246                       0
## 201   57   0                   1            130            308                       0
## 202   47   1                   1            110            249                       0
## 203   46   1                   3            120            230                       0
## 204   42   1                   3            160            147                       0
## 205   31   0                   2            100            219                       0
## 206   56   1                   2            130            184                       0
## 207   50   1                   4            150            215                       0
## 208   35   1                   2            120            308                       0
## 209   35   1                   2            110            257                       0
## 210   28   1                   2            130            132                       0
## 211   54   1                   4            125            216                       0
## 212   48   1                   4            106            263                       1
## 213   50   0                   3            140            288                       0
## 214   56   1                   3            130            276                       0
## 215   56   0                   3            130            219                       0
## 216   47   1                   4            150            226                       0
## 217   30   0                   1            170            237                       0
## 218   39   1                   4            110            280                       0
## 219   54   1                   3            120            217                       0
## 220   55   1                   2            140            196                       0
## 221   29   1                   2            140            263                       0
## 222   46   1                   4            130            222                       0
## 223   51   0                   4            160            303                       0
## 224   48   0                   3            120            195                       0
## 225   33   1                   3            120            298                       0
## 226   55   1                   2            120            256                       1
## 227   50   1                   4            145            264                       0
## 228   53   1                   3            120            195                       0
## 229   38   1                   4             92            117                       0
## 230   41   1                   2            120            295                       0
## 231   37   0                   4            130            173                       0
## 232   37   1                   4            130            315                       0
## 233   40   1                   3            130            281                       0
## 234   38   0                   2            120            275                       0
## 235   41   1                   4            112            250                       0
## 236   54   0                   2            140            309                       0
## 237   39   1                   2            120            200                       0
## 238   41   1                   4            120            336                       0
## 239   55   1                   1            140            295                       0
## 240   48   1                   4            160            355                       0
## 241   48   1                   4            160            193                       0
## 242   55   1                   2            145            326                       0
## 243   54   1                   4            200            198                       0
## 244   55   1                   2            160            292                       1
## 245   43   0                   2            120            266                       0
## 246   48   1                   4            160            268                       0
## 247   54   1                   1            120            171                       0
```

```
## 248   54  1                3           120          237                  0
## 249   48  1                4           122          275                  1
## 250   45  1                4           130          219                  0
## 251   49  1                4           130          341                  0
## 252   44  1                4           135          491                  0
## 253   48  1                4           120          260                  0
## 254   61  1                4           125          292                  0
## 255   62  1                2           140          271                  0
## 256   55  1                4           145          248                  0
## 257   53  0                3           120          274                  0
## 258   55  0                2           130          394                  0
## 259   36  1                3           150          160                  0
## 260   51  0                3           150          200                  0
## 261   55  0                2           122          320                  0
## 262   46  1                2           140          275                  0
## 263   54  0                2           120          221                  0
## 264   46  1                4           120          231                  0
## 265   59  1                4           130          126                  0
## 266   47  1                3           140          193                  0
## 267   54  1                2           160          305                  0
## 268   52  1                4           130          298                  0
## 269   34  1                2            98          220                  0
## 270   54  1                4           130          242                  0
## 271   47  0                3           130          235                  0
## 272   45  1                4           120          225                  0
## 273   32  0                2           105          198                  0
## 274   55  1                4           140          201                  0
## 275   55  1                3           120          220                  0
## 276   45  0                2           180          295                  0
## 277   59  1                3           180          213                  0
## 278   51  1                3           135          160                  0
## 279   52  1                4           170          223                  0
## 280   57  0                4           180          347                  0
## 281   54  0                2           130          253                  0
## 282   60  1                3           120          246                  0
## 283   49  1                4           150          222                  0
## 284   51  0                3           130          220                  0
## 285   55  0                2           110          344                  0
## 286   42  1                4           140          358                  0
## 287   51  0                3           110          190                  0
## 288   59  1                4           140          169                  0
## 289   53  1                2           120          181                  0
## 290   48  0                2           133          308                  0
## 291   36  1                2           120          166                  0
## 292   48  1                3           110          211                  0
## 293   47  0                2           140          257                  0
## 294   53  1                4           130          182                  0
## 418   63  1                4           140          260                  0
## 419   44  1                4           130          209                  0
## 420   60  1                4           132          218                  0
```

```
## 421   55   1                4           142          228                  0
## 422   66   1                3           110          213                  1
## 424   65   1                4           150          236                  1
## 427   60   1                2           160          267                  1
## 428   56   1                2           126          166                  0
## 433   62   1                4           120          220                  0
## 434   63   1                4           170          177                  0
## 435   46   1                4           110          236                  0
## 445   60   1                4           130          186                  1
## 446   56   1                4           120          100                  0
## 447   55   1                3           136          228                  0
## 449   77   1                4           124          171                  0
## 450   63   1                4           160          230                  1
## 454   60   1                4           140          281                  0
## 456   58   1                4           136          203                  1
## 462   57   1                4           139          277                  1
## 464   59   1                4           122          233                  0
## 467   42   1                3           134          240                  0
## 470   62   1                4           152          153                  0
## 471   56   1                2           124          224                  1
## 475   60   1                3           141          316                  1
## 478   51   1                4           132          218                  1
## 480   57   1                4           130          311                  1
## 484   67   1                1           142          270                  1
## 487   63   1                2           139          217                  1
## 488   55   1                2           110          214                  1
## 489   57   1                4           140          214                  0
## 490   65   1                1           140          252                  0
## 491   54   1                4           136          220                  0
## 492   72   1                3           120          214                  0
## 493   75   1                4           170          203                  1
## 495   51   1                3           137          339                  0
## 496   60   1                4           142          216                  0
## 497   64   0                4           142          276                  0
## 498   58   1                4           132          458                  1
## 499   61   1                4           146          241                  0
## 500   67   1                4           160          384                  1
## 501   62   1                4           135          297                  0
## 502   65   1                4           136          248                  0
## 503   63   1                4           130          308                  0
## 504   69   1                4           140          208                  0
## 505   51   1                4           132          227                  1
## 506   62   1                4           158          210                  1
## 507   55   1                3           136          245                  1
## 508   75   1                4           136          225                  0
## 509   40   1                3           106          240                  0
## 511   58   1                4           110          198                  0
## 512   60   1                4           136          195                  0
## 513   63   1                4           160          267                  1
## 514   35   1                3           123          161                  0
```

```
## 515   62  1              1         112        258              0
## 518   68  1              3         150        195              1
## 519   65  1              4         150        235              0
## 521   63  1              4          96        305              0
## 522   64  1              4         130        223              0
## 523   61  1              4         120        282              0
## 524   50  1              4         144        349              0
## 525   59  1              4         124        160              0
## 526   55  1              4         150        160              0
## 527   45  1              3         130        236              0
## 528   65  1              4         144        312              0
## 529   61  1              2         139        283              0
## 530   49  1              3         131        142              0
## 531   72  1              4         143        211              0
## 532   50  1              4         133        218              0
## 533   64  1              4         143        306              1
## 534   55  1              4         116        186              1
## 535   63  1              4         110        252              0
## 536   59  1              4         125        222              0
## 539   74  1              4         150        258              1
## 540   54  1              4         130        202              1
## 541   57  1              4         110        197              0
## 542   62  1              3         138        204              0
## 543   76  1              3         104        113              0
## 544   54  0              4         138        274              0
## 545   70  1              4         170        192              0
## 546   61  0              2         140        298              1
## 547   48  1              4         132        272              0
## 548   48  1              3         132        220              1
## 549   61  1              1         142        200              1
## 550   66  1              4         112        261              0
## 551   68  1              1         139        181              1
## 552   55  1              4         172        260              0
## 553   62  1              3         120        220              0
## 554   71  1              3         144        221              0
## 555   74  1              1         145        216              1
## 556   53  1              3         155        175              1
## 557   58  1              3         150        219              0
## 558   75  1              4         160        310              1
## 559   56  1              3         137        208              1
## 560   58  1              3         137        232              0
## 561   64  1              4         134        273              0
## 562   54  1              3         133        203              0
## 563   54  1              2         132        182              0
## 564   59  1              4         140        274              0
## 565   55  1              4         135        204              1
## 566   57  1              4         144        270              1
## 567   61  1              4         141        292              0
## 568   41  1              4         150        171              0
## 569   71  1              4         130        221              0
```

```
## 570   38   1                4           110          289                    0
## 571   55   1                4           158          217                    0
## 572   56   1                4           128          223                    0
## 573   69   1                4           140          110                    1
## 574   64   1                4           150          193                    0
## 575   72   1                4           160          123                    1
## 576   69   1                4           142          210                    1
## 577   56   1                4           137          282                    1
## 578   62   1                4           139          170                    0
## 579   67   1                4           146          369                    0
## 580   57   1                4           156          173                    0
## 581   69   1                4           145          289                    1
## 582   51   1                4           131          152                    1
## 583   48   1                4           140          208                    0
## 584   69   1                4           122          216                    1
## 585   69   1                3           142          271                    0
## 586   64   1                4           141          244                    1
## 587   57   1                2           180          285                    1
## 588   53   1                4           124          243                    0
## 589   37   1                3           118          240                    0
## 590   67   1                4           140          219                    0
## 591   74   1                3           140          237                    1
## 592   63   1                2           136          165                    0
## 593   58   1                4           100          213                    0
## 594   61   1                4           190          287                    1
## 595   64   1                4           130          258                    1
## 596   58   1                4           160          256                    1
## 597   60   1                4           130          186                    1
## 598   57   1                4           122          264                    0
## 599   55   1                3           133          185                    0
## 600   55   1                4           120          226                    0
## 601   56   1                4           130          203                    1
## 602   57   1                4           130          207                    0
## 603   61   1                3           140          284                    0
## 604   61   1                3           120          337                    0
## 605   58   1                3           150          219                    0
## 606   74   1                4           155          310                    0
## 607   68   1                3           134          254                    1
## 608   51   0                4           114          258                    1
## 609   62   1                4           160          254                    1
## 610   53   1                4           144          300                    1
## 611   62   1                4           158          170                    0
## 612   46   1                4           134          310                    0
## 613   54   0                4           127          333                    1
## 614   62   1                1           135          139                    0
## 615   55   1                4           122          223                    1
## 616   58   1                4           140          385                    1
## 617   62   1                2           120          254                    0
## 618   70   1                4           130          322                    0
## 619   67   0                3           115          564                    0
```

```
## 620   57   1         2       124      261       0
## 621   64   1         4       128      263       0
## 622   74   0         2       120      269       0
## 623   65   1         4       120      177       0
## 624   56   1         3       130      256       1
## 625   59   1         4       110      239       0
## 626   60   1         4       140      293       0
## 627   63   0         4       150      407       0
## 628   59   1         4       135      234       0
## 629   53   1         4       142      226       0
## 630   44   1         3       140      235       0
## 631   61   1         1       134      234       0
## 632   57   0         4       128      303       0
## 633   71   0         4       112      149       0
## 634   46   1         4       140      311       0
## 635   53   1         4       140      203       1
## 636   64   1         1       110      211       0
## 637   40   1         1       140      199       0
## 638   67   1         4       120      229       0
## 639   48   1         2       130      245       0
## 640   43   1         4       115      303       0
## 641   47   1         4       112      204       0
## 642   54   0         2       132      288       1
## 643   48   0         3       130      275       0
## 644   46   0         4       138      243       0
## 645   51   0         3       120      295       0
## 646   58   1         3       112      230       0
## 647   71   0         3       110      265       1
## 648   57   1         3       128      229       0
## 649   66   1         4       160      228       0
## 650   37   0         3       120      215       0
## 651   59   1         4       170      326       0
## 652   50   1         4       144      200       0
## 653   48   1         4       130      256       1
## 654   61   1         4       140      207       0
## 655   59   1         1       160      273       0
## 656   42   1         3       130      180       0
## 657   48   1         4       122      222       0
## 658   40   1         4       152      223       0
## 659   62   0         4       124      209       0
## 660   44   1         3       130      233       0
## 661   46   1         2       101      197       1
## 662   59   1         3       126      218       1
## 663   58   1         3       140      211       1
## 664   49   1         3       118      149       0
## 665   44   1         4       110      197       0
## 666   66   1         2       160      246       0
## 667   65   0         4       150      225       0
## 668   42   1         4       136      315       0
## 669   52   1         2       128      205       1
```

```
## 670   65   0                3           140           417                    1
## 671   63   0                2           140           195                    0
## 672   45   0                2           130           234                    0
## 673   41   0                2           105           198                    0
## 674   61   1                4           138           166                    0
## 675   60   0                3           120           178                    1
## 676   59   0                4           174           249                    0
## 677   62   1                2           120           281                    0
## 678   57   1                3           150           126                    1
## 679   51   0                4           130           305                    0
## 680   44   1                3           120           226                    0
## 681   60   0                1           150           240                    0
## 682   63   1                1           145           233                    1
## 683   57   1                4           150           276                    0
## 684   51   1                4           140           261                    0
## 685   58   0                2           136           319                    1
## 686   44   0                3           118           242                    0
## 687   47   1                3           108           243                    0
## 688   61   1                4           120           260                    0
## 689   57   0                4           120           354                    0
## 690   70   1                2           156           245                    0
## 691   76   0                3           140           197                    0
## 692   67   0                4           106           223                    0
## 693   45   1                4           142           309                    0
## 694   45   1                4           104           208                    0
## 695   39   0                3            94           199                    0
## 696   42   0                3           120           209                    0
## 697   56   1                2           120           236                    0
## 698   58   1                4           146           218                    0
## 699   35   1                4           120           198                    0
## 700   58   1                4           150           270                    0
## 701   41   1                3           130           214                    0
## 702   57   1                4           110           201                    0
## 703   42   1                1           148           244                    0
## 704   62   1                2           128           208                    1
## 705   59   1                1           178           270                    0
## 706   41   0                2           126           306                    0
## 707   50   1                4           150           243                    0
## 708   59   1                2           140           221                    0
## 709   61   0                4           130           330                    0
## 710   54   1                4           124           266                    0
## 711   54   1                4           110           206                    0
## 712   52   1                4           125           212                    0
## 713   47   1                4           110           275                    0
## 714   66   1                4           120           302                    0
## 715   58   1                4           100           234                    0
## 716   64   0                3           140           313                    0
## 717   50   0                2           120           244                    0
## 718   44   0                3           108           141                    0
## 719   67   1                4           120           237                    0
```

```
## 720   49   0              4            130            269                      0
## 721   57   1              4            165            289                      1
## 722   63   1              4            130            254                      0
## 723   48   1              4            124            274                      0
## 724   51   1              3            100            222                      0
## 725   60   0              4            150            258                      0
## 726   59   1              4            140            177                      0
## 727   45   0              2            112            160                      0
## 728   55   0              4            180            327                      0
## 729   41   1              2            110            235                      0
## 730   60   0              4            158            305                      0
## 731   54   0              3            135            304                      1
## 732   42   1              2            120            295                      0
## 733   49   0              2            134            271                      0
## 734   46   1              4            120            249                      0
## 735   56   0              4            200            288                      1
## 736   66   0              1            150            226                      0
## 737   56   1              4            130            283                      1
## 738   49   1              3            120            188                      0
## 739   54   1              4            122            286                      0
## 740   57   1              4            152            274                      0
## 741   65   0              3            160            360                      0
## 742   54   1              3            125            273                      0
## 743   54   0              3            160            201                      0
## 744   62   1              4            120            267                      0
## 745   52   0              3            136            196                      0
## 746   52   1              2            134            201                      0
## 747   60   1              4            117            230                      1
## 748   63   0              4            108            269                      0
## 749   66   1              4            112            212                      0
## 750   42   1              4            140            226                      0
## 751   64   1              4            120            246                      0
## 752   54   1              3            150            232                      0
## 753   46   0              3            142            177                      0
## 754   67   0              3            152            277                      0
## 755   56   1              4            125            249                      1
## 756   34   0              2            118            210                      0
## 757   57   1              4            132            207                      0
## 758   64   1              4            145            212                      0
## 759   59   1              4            138            271                      0
## 760   50   1              3            140            233                      0
## 761   51   1              1            125            213                      0
## 762   54   1              2            192            283                      0
## 763   53   1              4            123            282                      0
## 764   52   1              4            112            230                      0
## 765   40   1              4            110            167                      0
## 766   58   1              3            132            224                      0
## 767   41   0              3            112            268                      0
## 768   41   1              3            112            250                      0
## 769   50   0              3            120            219                      0
```

```
## 770   54   0               3          108          267               0
## 771   64   0               4          130          303               0
## 772   51   0               3          130          256               0
## 773   46   0               2          105          204               0
## 774   55   1               4          140          217               0
## 775   45   1               2          128          308               0
## 776   56   1               1          120          193               0
## 777   66   0               4          178          228               1
## 778   38   1               1          120          231               0
## 779   62   0               4          150          244               0
## 780   55   1               2          130          262               0
## 781   58   1               4          128          259               0
## 782   43   1               4          110          211               0
## 783   64   0               4          180          325               0
## 784   50   0               4          110          254               0
## 785   53   1               3          130          197               1
## 786   45   0               4          138          236               0
## 787   65   1               1          138          282               1
## 788   69   1               1          160          234               1
## 789   69   1               3          140          254               0
## 790   67   1               4          100          299               0
## 791   68   0               3          120          211               0
## 792   34   1               1          118          182               0
## 793   62   0               4          138          294               1
## 794   51   1               4          140          298               0
## 795   46   1               3          150          231               0
## 796   67   1               4          125          254               1
## 797   50   1               3          129          196               0
## 798   42   1               3          120          240               1
## 799   56   0               4          134          409               0
## 800   41   1               4          110          172               0
## 801   42   0               4          102          265               0
## 802   53   1               3          130          246               1
## 803   43   1               3          130          315               0
## 804   56   1               4          132          184               0
## 805   52   1               4          108          233               1
## 806   62   0               4          140          394               0
## 807   70   1               3          160          269               0
## 808   54   1               4          140          239               0
## 809   70   1               4          145          174               0
## 810   54   1               2          108          309               0
## 811   35   1               4          126          282               0
## 812   48   1               3          124          255               1
## 813   55   0               2          135          250               0
## 814   58   0               4          100          248               0
## 815   54   0               3          110          214               0
## 816   69   0               1          140          239               0
## 817   77   1               4          125          304               0
## 818   68   1               3          118          277               0
## 819   58   1               4          125          300               0
```

```
## 820   60   1                4            125            258                    0
## 821   51   1                4            140            299                    0
## 822   55   1                4            160            289                    0
## 823   52   1                1            152            298                    1
## 824   60   0                3            102            318                    0
## 825   58   1                3            105            240                    0
## 826   64   1                3            125            309                    0
## 827   37   1                3            130            250                    0
## 828   59   1                1            170            288                    0
## 829   51   1                3            125            245                    1
## 830   43   0                3            122            213                    0
## 831   58   1                4            128            216                    0
## 832   29   1                2            130            204                    0
## 833   41   0                2            130            204                    0
## 834   63   0                3            135            252                    0
## 835   51   1                3             94            227                    0
## 836   54   1                3            120            258                    0
## 837   44   1                2            120            220                    0
## 838   54   1                4            110            239                    0
## 839   65   1                4            135            254                    0
## 840   57   1                3            150            168                    0
## 841   63   1                4            130            330                    1
## 842   35   0                4            138            183                    0
## 843   41   1                2            135            203                    0
## 844   62   0                3            130            263                    0
## 845   43   0                4            132            341                    1
## 846   58   0                1            150            283                    1
## 847   52   1                1            118            186                    0
## 848   61   0                4            145            307                    0
## 849   39   1                4            118            219                    0
## 850   45   1                4            115            260                    0
## 851   52   1                4            128            255                    0
## 852   62   1                3            130            231                    0
## 853   62   0                4            160            164                    0
## 854   53   0                4            138            234                    0
## 855   43   1                4            120            177                    0
## 856   47   1                3            138            257                    0
## 857   52   1                2            120            325                    0
## 858   68   1                3            180            274                    1
## 859   39   1                3            140            321                    0
## 860   53   0                4            130            264                    0
## 861   62   0                4            140            268                    0
## 862   51   0                3            140            308                    0
## 863   60   1                4            130            253                    0
## 864   65   1                4            110            248                    0
## 865   65   0                3            155            269                    0
## 866   60   1                3            140            185                    0
## 867   60   1                4            145            282                    0
## 868   54   1                4            120            188                    0
## 869   44   1                2            130            219                    0
```

```
## 870   44   1                4           112          290                   0
## 871   51   1                3           110          175                   0
## 872   59   1                3           150          212                   1
## 873   71   0                2           160          302                   0
## 874   61   1                3           150          243                   1
## 875   55   1                4           132          353                   0
## 876   64   1                3           140          335                   0
## 877   43   1                4           150          247                   0
## 878   58   0                3           120          340                   0
## 879   60   1                4           130          206                   0
## 880   58   1                2           120          284                   0
## 881   49   1                2           130          266                   0
## 882   48   1                2           110          229                   0
## 883   52   1                3           172          199                   1
## 884   44   1                2           120          263                   0
## 885   56   0                2           140          294                   0
## 886   57   1                4           140          192                   0
## 887   67   1                4           160          286                   0
## 888   63   1                1           145          233                   1
## 889   67   1                4           160          286                   0
## 890   67   1                4           120          229                   0
## 891   37   1                3           130          250                   0
## 892   41   0                2           130          204                   0
## 893   56   1                2           120          236                   0
## 894   62   0                4           140          268                   0
## 895   57   0                4           120          354                   0
## 896   63   1                4           130          254                   0
## 897   53   1                4           140          203                   1
## 898   57   1                4           140          192                   0
## 899   56   0                2           140          294                   0
## 900   56   1                3           130          256                   1
## 901   44   1                2           120          263                   0
## 902   52   1                3           172          199                   1
## 903   57   1                3           150          168                   0
## 904   48   1                2           110          229                   0
## 905   54   1                4           140          239                   0
## 906   48   0                3           130          275                   0
## 907   49   1                2           130          266                   0
## 908   64   1                1           110          211                   0
## 909   58   0                1           150          283                   1
## 910   58   1                2           120          284                   0
## 911   58   1                3           132          224                   0
## 912   60   1                4           130          206                   0
## 913   50   0                3           120          219                   0
## 914   58   0                3           120          340                   0
## 915   66   0                1           150          226                   0
## 916   43   1                4           150          247                   0
## 917   40   1                4           110          167                   0
## 918   69   0                1           140          239                   0
## 919   60   1                4           117          230                   1
```

```
## 920   64   1            3          140         335           0
## 921   59   1            4          135         234           0
## 922   44   1            3          130         233           0
## 923   42   1            4          140         226           0
## 924   43   1            4          120         177           0
## 925   57   1            4          150         276           0
## 926   55   1            4          132         353           0
## 927   61   1            3          150         243           1
## 928   65   0            4          150         225           0
## 929   40   1            1          140         199           0
## 930   71   0            2          160         302           0
## 931   59   1            3          150         212           1
## 932   61   0            4          130         330           0
## 933   58   1            3          112         230           0
## 934   51   1            3          110         175           0
## 935   50   1            4          150         243           0
## 936   65   0            3          140         417           1
## 937   53   1            3          130         197           1
## 938   41   0            2          105         198           0
## 939   65   1            4          120         177           0
## 940   44   1            4          112         290           0
## 941   44   1            2          130         219           0
## 942   60   1            4          130         253           0
## 943   54   1            4          124         266           0
## 944   50   1            3          140         233           0
## 945   41   1            4          110         172           0
## 946   54   1            3          125         273           0
## 947   51   1            1          125         213           0
## 948   51   0            4          130         305           0
## 949   46   0            3          142         177           0
## 950   58   1            4          128         216           0
## 951   54   0            3          135         304           1
## 952   54   1            4          120         188           0
## 953   60   1            4          145         282           0
## 954   60   1            3          140         185           0
## 955   54   1            3          150         232           0
## 956   59   1            4          170         326           0
## 957   46   1            3          150         231           0
## 958   65   0            3          155         269           0
## 959   67   1            4          125         254           1
## 960   62   1            4          120         267           0
## 961   65   1            4          110         248           0
## 962   44   1            4          110         197           0
## 963   65   0            3          160         360           0
## 964   60   1            4          125         258           0
## 965   51   0            3          140         308           0
## 966   48   1            2          130         245           0
## 967   58   1            4          150         270           0
## 968   45   1            4          104         208           0
## 969   53   0            4          130         264           0
```

```
## 970   39   1                3            140          321                   0
## 971   68   1                3            180          274                   1
## 972   52   1                2            120          325                   0
## 973   44   1                3            140          235                   0
## 974   47   1                3            138          257                   0
## 975   53   0                3            128          216                   0
## 976   53   0                4            138          234                   0
## 977   51   0                3            130          256                   0
## 978   66   1                4            120          302                   0
## 979   62   0                4            160          164                   0
## 980   62   1                3            130          231                   0
## 981   44   0                3            108          141                   0
## 982   63   0                3            135          252                   0
## 983   52   1                4            128          255                   0
## 984   59   1                4            110          239                   0
## 985   60   0                4            150          258                   0
## 986   52   1                2            134          201                   0
## 987   48   1                4            122          222                   0
## 988   45   1                4            115          260                   0
## 989   34   1                1            118          182                   0
## 990   57   0                4            128          303                   0
## 991   71   0                3            110          265                   1
## 992   49   1                3            120          188                   0
## 993   54   1                2            108          309                   0
## 994   59   1                4            140          177                   0
## 995   57   1                3            128          229                   0
## 996   61   1                4            120          260                   0
## 997   39   1                4            118          219                   0
## 998   61   0                4            145          307                   0
## 999   56   1                4            125          249                   1
## 1000  52   1                1            118          186                   0
## 1001  43   0                4            132          341                   1
## 1002  62   0                3            130          263                   0
## 1003  41   1                2            135          203                   0
## 1004  58   1                3            140          211                   1
## 1005  35   0                4            138          183                   0
## 1006  63   1                4            130          330                   1
## 1007  65   1                4            135          254                   0
## 1008  48   1                4            130          256                   1
## 1009  63   0                4            150          407                   0
## 1010  51   1                3            100          222                   0
## 1011  55   1                4            140          217                   0
## 1012  65   1                1            138          282                   1
## 1013  45   0                2            130          234                   0
## 1014  56   0                4            200          288                   1
## 1015  54   1                4            110          239                   0
## 1016  44   1                2            120          220                   0
## 1017  62   0                4            124          209                   0
## 1018  54   1                3            120          258                   0
## 1019  51   1                3             94          227                   0
```

```
## 1020  29   1               2             130           204                     0
## 1021  51   1               4             140           261                     0
## 1022  43   0               3             122           213                     0
## 1023  55   0               2             135           250                     0
## 1024  70   1               4             145           174                     0
## 1025  62   1               2             120           281                     0
## 1026  35   1               4             120           198                     0
## 1027  51   1               3             125           245                     1
## 1028  59   1               2             140           221                     0
## 1029  59   1               1             170           288                     0
## 1030  52   1               2             128           205                     1
## 1031  64   1               3             125           309                     0
## 1032  58   1               3             105           240                     0
## 1033  47   1               3             108           243                     0
## 1034  57   1               4             165           289                     1
## 1035  41   1               3             112           250                     0
## 1036  45   1               2             128           308                     0
## 1037  60   0               3             102           318                     0
## 1038  52   1               1             152           298                     1
## 1039  42   0               4             102           265                     0
## 1040  67   0               3             115           564                     0
## 1041  55   1               4             160           289                     0
## 1042  64   1               4             120           246                     0
## 1043  70   1               4             130           322                     0
## 1044  51   1               4             140           299                     0
## 1045  58   1               4             125           300                     0
## 1046  60   1               4             140           293                     0
## 1047  68   1               3             118           277                     0
## 1048  46   1               2             101           197                     1
## 1049  77   1               4             125           304                     0
## 1050  54   0               3             110           214                     0
## 1051  58   0               4             100           248                     0
## 1052  48   1               3             124           255                     1
## 1053  57   1               4             132           207                     0
## 1054  52   1               3             138           223                     0
## 1055  54   0               2             132           288                     1
## 1056  35   1               4             126           282                     0
## 1057  45   0               2             112           160                     0
## 1058  70   1               3             160           269                     0
## 1059  53   1               4             142           226                     0
## 1060  59   0               4             174           249                     0
## 1061  62   0               4             140           394                     0
## 1062  64   1               4             145           212                     0
## 1063  57   1               4             152           274                     0
## 1064  52   1               4             108           233                     1
## 1065  56   1               4             132           184                     0
## 1066  43   1               3             130           315                     0
## 1067  53   1               3             130           246                     1
## 1068  48   1               4             124           274                     0
## 1069  56   0               4             134           409                     0
```

```
## 1070  42   1                1           148          244                   0
## 1071  59   1                1           178          270                   0
## 1072  60   0                4           158          305                   0
## 1073  63   0                2           140          195                   0
## 1074  42   1                3           120          240                   1
## 1075  66   1                2           160          246                   0
## 1076  54   1                2           192          283                   0
## 1077  69   1                3           140          254                   0
## 1078  50   1                3           129          196                   0
## 1079  51   1                4           140          298                   0
## 1080  43   1                4           132          247                   1
## 1081  62   0                4           138          294                   1
## 1082  68   0                3           120          211                   0
## 1083  67   1                4           100          299                   0
## 1084  69   1                1           160          234                   1
## 1085  45   0                4           138          236                   0
## 1086  50   0                2           120          244                   0
## 1087  59   1                1           160          273                   0
## 1088  50   0                4           110          254                   0
## 1089  64   0                4           180          325                   0
## 1090  57   1                3           150          126                   1
## 1091  64   0                3           140          313                   0
## 1092  43   1                4           110          211                   0
## 1093  45   1                4           142          309                   0
## 1094  58   1                4           128          259                   0
## 1095  50   1                4           144          200                   0
## 1096  55   1                2           130          262                   0
## 1097  62   0                4           150          244                   0
## 1098  37   0                3           120          215                   0
## 1099  38   1                1           120          231                   0
## 1100  41   1                3           130          214                   0
## 1101  66   0                4           178          228                   1
## 1102  52   1                4           112          230                   0
## 1103  56   1                1           120          193                   0
## 1104  46   0                2           105          204                   0
## 1105  46   0                4           138          243                   0
## 1106  64   0                4           130          303                   0
## 1107  59   1                4           138          271                   0
## 1108  41   0                3           112          268                   0
## 1109  54   0                3           108          267                   0
## 1110  39   0                3            94          199                   0
## 1111  53   1                4           123          282                   0
## 1112  63   0                4           108          269                   0
## 1113  34   0                2           118          210                   0
## 1114  47   1                4           112          204                   0
## 1115  67   0                3           152          277                   0
## 1116  54   1                4           110          206                   0
## 1117  66   1                4           112          212                   0
## 1118  52   0                3           136          196                   0
## 1119  55   0                4           180          327                   0
```

```
## 1120  49   1                3          118          149                   0
## 1121  74   0                2          120          269                   0
## 1122  54   0                3          160          201                   0
## 1123  54   1                4          122          286                   0
## 1124  56   1                4          130          283                   1
## 1125  46   1                4          120          249                   0
## 1126  49   0                2          134          271                   0
## 1127  42   1                2          120          295                   0
## 1128  41   1                2          110          235                   0
## 1129  41   0                2          126          306                   0
## 1130  49   0                4          130          269                   0
## 1131  61   1                1          134          234                   0
## 1132  60   0                3          120          178                   1
## 1133  67   1                4          120          237                   0
## 1134  58   1                4          100          234                   0
## 1135  47   1                4          110          275                   0
## 1136  52   1                4          125          212                   0
## 1137  62   1                2          128          208                   1
## 1138  57   1                4          110          201                   0
## 1139  58   1                4          146          218                   0
## 1140  64   1                4          128          263                   0
## 1141  51   0                3          120          295                   0
## 1142  43   1                4          115          303                   0
## 1143  42   0                3          120          209                   0
## 1144  67   0                4          106          223                   0
## 1145  76   0                3          140          197                   0
## 1146  70   1                2          156          245                   0
## 1147  57   1                2          124          261                   0
## 1148  44   0                3          118          242                   0
## 1149  58   0                2          136          319                   1
## 1150  60   0                1          150          240                   0
## 1151  44   1                3          120          226                   0
## 1152  61   1                4          138          166                   0
## 1153  42   1                4          136          315                   0
## 1154  52   1                4          128          204                   1
## 1155  59   1                3          126          218                   1
## 1156  40   1                4          152          223                   0
## 1157  42   1                3          130          180                   0
## 1158  61   1                4          140          207                   0
## 1159  66   1                4          160          228                   0
## 1160  46   1                4          140          311                   0
## 1161  71   0                4          112          149                   0
## 1162  59   1                1          134          204                   0
## 1163  64   1                1          170          227                   0
## 1164  66   0                3          146          278                   0
## 1165  39   0                3          138          220                   0
## 1166  57   1                2          154          232                   0
## 1167  58   0                4          130          197                   0
## 1168  57   1                4          110          335                   0
## 1169  47   1                3          130          253                   0
```

```
## 1170  55   0               4          128         205                  0
## 1171  35   1               2          122         192                  0
## 1172  61   1               4          148         203                  0
## 1173  58   1               4          114         318                  0
## 1174  58   0               4          170         225                  1
## 1175  58   1               2          125         220                  0
## 1176  56   1               2          130         221                  0
## 1177  56   1               2          120         240                  0
## 1178  67   1               3          152         212                  0
## 1179  55   0               2          132         342                  0
## 1180  44   1               4          120         169                  0
## 1181  63   1               4          140         187                  0
## 1182  63   0               4          124         197                  0
## 1183  41   1               2          120         157                  0
## 1184  59   1               4          164         176                  1
## 1185  57   0               4          140         241                  0
## 1186  45   1               1          110         264                  0
## 1187  68   1               4          144         193                  1
## 1188  57   1               4          130         131                  0
## 1189  57   0               2          130         236                  0
## 1190  38   1               3          138         175                  0
##      resting.ecg max.heart.rate exercise.angina oldpeak ST.slope target
## 1              0            172               0     0.0        1      0
## 2              0            156               0     1.0        2      1
## 3              1             98               0     0.0        1      0
## 4              0            108               1     1.5        2      1
## 5              0            122               0     0.0        1      0
## 6              0            170               0     0.0        1      0
## 7              0            170               0     0.0        1      0
## 8              0            142               0     0.0        1      0
## 9              0            130               1     1.5        2      1
## 10             0            120               0     0.0        1      0
## 11             0            142               0     0.0        1      0
## 12             1             99               1     2.0        2      1
## 13             0            145               0     0.0        1      0
## 14             0            140               1     1.0        2      1
## 15             1            137               0     0.0        1      0
## 16             0            150               0     1.5        2      0
## 17             0            166               0     0.0        2      1
## 18             0            165               0     0.0        1      0
## 19             0            125               0     1.0        2      1
## 20             0            160               0     3.0        2      1
## 21             0            142               0     0.0        1      0
## 22             0            142               0     1.0        2      0
## 23             0            164               0     0.0        1      0
## 24             0            150               1     3.0        2      1
## 25             0            138               0     0.0        1      0
## 26             0            178               0     0.0        1      0
## 27             1            112               1     3.0        2      0
## 28             0            118               0     0.0        1      0
```

```
## 29              0           127             0     0.0         1      0
## 30              0           145             0     0.0         1      0
## 31              0           130             0     0.0         2      1
## 32              0           114             0     0.0         1      0
## 33              0           122             0     2.0         2      1
## 34              1           130             0     2.0         2      1
## 35              0           154             0     0.0         1      0
## 36              0           155             0     0.0         1      0
## 37              0            87             1     1.5         2      1
## 38              1           142             0     0.0         1      0
## 39              1           148             0     0.0         1      0
## 40              0           130             1     1.0         2      0
## 41              0           130             0     0.0         1      0
## 42              1           100             1     0.0         2      1
## 43              0           168             0     0.0         1      0
## 44              1           170             0     0.0         1      0
## 45              0           120             1     1.0         2      1
## 46              0           120             1     1.0         2      0
## 47              0           168             0     0.0         1      0
## 48              0           170             0     0.0         1      0
## 49              0           184             0     1.0         2      0
## 50              0           170             0     0.0         2      1
## 51              0           121             1     2.0         2      1
## 52              0            98             1     2.0         2      1
## 53              0           122             0     0.0         1      0
## 54              0           150             0     0.0         1      0
## 55              0           140             1     1.5         2      0
## 56              0           170             0     0.0         1      0
## 57              0           153             1     1.5         2      1
## 58              1           140             0     0.0         2      1
## 59              1           134             0     1.0         1      0
## 60              1            96             1     1.0         2      1
## 61              0           174             0     0.0         1      0
## 62              0           175             0     0.0         1      0
## 63              0           144             0     0.0         1      0
## 64              0           125             1     1.0         2      1
## 65              0           145             0     0.0         1      0
## 66              0           130             0     0.0         1      0
## 67              0           144             0     0.0         1      0
## 68              0           184             0     0.0         1      0
## 69              1            82             1     4.0         2      1
## 70              0           170             0     0.0         1      0
## 71              1           145             1     1.0         2      1
## 72              0           135             0     0.0         1      0
## 73              0           150             0     0.0         2      1
## 74              1           115             0     0.0         1      0
## 75              0           128             1     1.5         2      1
## 76              0           116             0     0.0         1      0
## 77              0           130             0     0.0         2      1
## 78              0           150             0     0.0         1      0
```

```
## 79            0       138          1    0.0       1     0
## 80            0       170          0    0.0       2     1
## 81            0       160          0    0.0       1     0
## 82            0       154          0    0.0       1     0
## 83            0       115          0    0.0       2     1
## 84            0       165          0    0.0       1     0
## 85            0       125          1    1.0       2     1
## 86            0        94          1    1.0       2     1
## 87            0       112          1    2.0       2     1
## 88            0       142          1    2.0       2     0
## 89            1       155          0    0.0       2     1
## 90            0       110          1    0.5       2     0
## 91            0       160          0    0.0       1     0
## 92            0       140          0    0.0       1     0
## 93            0       148          0    0.0       1     0
## 94            0        92          1    1.5       2     1
## 95            1       180          0    0.0       1     0
## 96            0       140          1    2.0       2     1
## 97            0       138          0    0.0       1     0
## 98            0       160          0    0.0       1     0
## 99            0       140          0    0.0       1     0
## 100           0       144          0    0.0       1     0
## 101           1       115          1    1.0       2     1
## 102           0       100          0    0.0       1     0
## 103           0       130          0    2.0       2     1
## 104           0       152          1    1.0       2     1
## 105           0       124          0    0.0       2     1
## 106           0       140          0    0.0       1     0
## 107           1       110          0    0.0       1     0
## 108           1       168          0    0.0       1     0
## 109           0       135          0    0.0       1     0
## 110           0       106          0    0.0       1     0
## 111           0       124          0    1.0       2     0
## 112           0        92          1    3.0       2     1
## 113           0       125          1    0.0       1     0
## 114           0       150          0    0.0       1     0
## 115           1       135          0    0.0       1     0
## 116           0       150          1    1.0       2     1
## 117           0       170          0    0.0       2     1
## 118           1       130          1    1.5       2     1
## 119           1       185          0    0.0       1     0
## 120           0       180          0    0.0       2     1
## 121           0       170          0    0.0       2     1
## 122           0       139          0    0.0       1     0
## 123           1       140          0    0.0       1     0
## 124           0       110          1    1.0       2     1
## 125           0       150          0    0.0       1     0
## 126           0       110          0    0.0       1     0
## 127           0       190          0    0.0       1     0
## 128           0       175          0    2.0       1     0
```

```
## 129                  0            140                 0      0.0           1       0
## 130                  0            152                 1      1.5           2       0
## 131                  0            130                 0      0.0           1       0
## 132                  0            150                 1      0.0           2       1
## 133                  1            122                 1      2.0           2       1
## 134                  1            124                 1      1.5           2       1
## 135                  1            120                 1      1.0           2       0
## 136                  0            175                 0      0.0           2       1
## 137                  1            175                 0      0.0           1       0
## 138                  1            146                 0      2.0           1       0
## 139                  0            118                 1      0.0           2       1
## 140                  0            130                 1      2.0           2       1
## 141                  0             94                 1      2.5           2       1
## 142                  1            125                 1      2.5           2       1
## 143                  1            158                 1      3.0           2       1
## 144                  0            155                 0      0.0           1       0
## 145                  0            150                 0      1.0           2       1
## 146                  0            132                 0      0.0           1       0
## 147                  0            155                 0      0.0           1       0
## 148                  1            176                 0      0.0           1       0
## 149                  0            160                 0      0.0           1       0
## 150                  0            125                 1      1.0           2       1
## 151                  0            120                 0      0.0           1       0
## 152                  0            100                 0      0.0           1       0
## 153                  0            150                 0      0.0           1       0
## 154                  0            140                 0      0.0           1       0
## 155                  1            160                 0      0.0           1       0
## 156                  0            150                 1      3.0           2       1
## 157                  0            150                 1      1.0           2       1
## 158                  0            130                 0      0.0           1       0
## 159                  0            100                 1      2.0           2       1
## 160                  1            130                 0      1.0           1       0
## 161                  2            119                 1      0.0           2       1
## 162                  0             96                 1      0.0           2       1
## 163                  0            174                 0      0.0           1       0
## 164                  0            160                 0      0.0           1       0
## 165                  0            150                 0      0.0           1       0
## 166                  0            140                 0      0.0           1       0
## 167                  0            175                 0      2.0           2       1
## 168                  1            140                 1      5.0           2       1
## 169                  0            118                 0      0.0           1       0
## 170                  0            100                 0      0.0           1       0
## 171                  0            160                 0      0.0           1       0
## 172                  0            160                 0      0.0           1       0
## 173                  0            188                 0      0.0           1       0
## 174                  0            162                 0      0.0           1       0
## 175                  0            172                 0      0.0           1       0
## 176                  0            134                 1      2.0           2       1
## 177                  0            135                 1      2.0           2       1
## 178                  0            105                 0      1.5           2       1
```

```
## 179        0     150        0    0.0     1     0
## 180        0     150        0    0.0     1     0
## 181        0      90        0    0.0     1     0
## 182        0     120        1    2.0     2     1
## 183        0     150        0    0.0     1     0
## 184        0     124        1    2.0     2     1
## 185        1     140        1    1.0     2     0
## 186        0     130        0    0.0     1     0
## 187        1      92        0    0.0     2     1
## 188        0     110        0    0.0     1     0
## 189        0     138        1    1.0     2     1
## 190        0     110        1    1.0     2     0
## 191        1     120        1    1.5     2     1
## 192        1     120        0    0.0     1     0
## 193        1     116        0    0.0     1     0
## 194        0     160        0    0.0     1     0
## 195        0     110        0    0.0     1     0
## 196        0     180        0    0.0     1     0
## 197        0     116        0    0.0     1     0
## 198        0     132        0    1.0     2     0
## 199        0     136        0    0.0     1     0
## 200        0     116        1    0.0     2     1
## 201        0      98        0    1.0     2     0
## 202        0     150        0    0.0     1     0
## 203        0     150        0    0.0     1     0
## 204        0     146        0    0.0     1     0
## 205        1     150        0    0.0     1     0
## 206        0     100        0    0.0     1     0
## 207        0     140        1    0.0     1     0
## 208        2     180        0    0.0     1     0
## 209        0     140        0    0.0     2     1
## 210        2     185        0    0.0     1     0
## 211        0     140        0    0.0     2     1
## 212        0     110        0    0.0     2     1
## 213        0     140        1    0.0     2     1
## 214        0     128        1    1.0     1     0
## 215        1     164        0    0.0     1     0
## 216        0      98        1    1.5     2     1
## 217        1     170        0    0.0     1     0
## 218        0     150        0    0.0     2     1
## 219        0     137        0    0.0     1     0
## 220        0     150        0    0.0     1     0
## 221        0     170        0    0.0     1     0
## 222        0     112        0    0.0     2     1
## 223        0     150        1    1.0     2     1
## 224        0     125        0    0.0     1     0
## 225        0     185        0    0.0     1     0
## 226        0     137        0    0.0     1     0
## 227        0     150        0    0.0     2     1
## 228        0     140        0    0.0     1     0
```

```
## 229            0          134            1     2.5         2      1
## 230            0          170            0     0.0         1      0
## 231            1          184            0     0.0         1      0
## 232            0          158            0     0.0         1      0
## 233            0          167            0     0.0         1      0
## 234            0          129            0     0.0         1      0
## 235            0          142            0     0.0         1      0
## 236            1          140            0     0.0         1      0
## 237            0          160            1     1.0         2      0
## 238            0          118            1     3.0         2      1
## 239            0          136            0     0.0         2      1
## 240            0           99            1     2.0         2      1
## 241            0          102            1     3.0         2      1
## 242            0          155            0     0.0         1      0
## 243            0          142            1     2.0         2      1
## 244            0          143            1     2.0         2      1
## 245            0          118            0     0.0         1      0
## 246            0          103            1     1.0         2      1
## 247            0          137            0     2.0         1      0
## 248            0          150            1     1.5         2      1
## 249            1          150            1     2.0         3      1
## 250            1          130            1     1.0         2      1
## 251            0          120            1     1.0         2      1
## 252            0          135            0     0.0         2      1
## 253            0          115            0     2.0         2      1
## 254            1          115            1     0.0         1      0
## 255            0          152            0     1.0         1      0
## 256            0           96            1     2.0         2      1
## 257            0          130            0     0.0         1      0
## 258            2          150            0     0.0         1      0
## 259            0          172            0     0.0         1      0
## 260            0          120            0     0.5         1      0
## 261            0          155            0     0.0         1      0
## 262            0          165            1     0.0         1      0
## 263            0          138            0     1.0         1      0
## 264            0          115            1     0.0         2      1
## 265            0          125            0     0.0         2      1
## 266            0          145            1     1.0         2      1
## 267            0          175            0     0.0         1      0
## 268            0          110            1     1.0         2      1
## 269            0          150            0     0.0         1      0
## 270            0           91            1     1.0         2      1
## 271            0          145            0     2.0         2      0
## 272            0          140            0     0.0         1      0
## 273            0          165            0     0.0         1      0
## 274            0          130            1     3.0         2      1
## 275            2          134            0     0.0         1      0
## 276            0          180            0     0.0         1      0
## 277            0          100            0     0.0         1      0
## 278            0          150            0     2.0         2      1
```

```
## 279         0         126          1     1.5        2      1
## 280         1         126          1     0.8        2      0
## 281         1         155          0     0.0        1      0
## 282         2         135          0     0.0        1      0
## 283         0         122          0     2.0        2      1
## 284         0         160          1     2.0        1      0
## 285         1         160          0     0.0        1      0
## 286         0         170          0     0.0        1      0
## 287         0         120          0     0.0        1      0
## 288         0         140          0     0.0        1      0
## 289         0         132          0     0.0        1      0
## 290         1         156          0     2.0        1      0
## 291         0         180          0     0.0        1      0
## 292         0         138          0     0.0        1      0
## 293         0         135          0     1.0        1      0
## 294         0         148          0     0.0        1      0
## 418         1         112          1     3.0        2      1
## 419         1         127          0     0.0        1      0
## 420         1         140          1     1.5        3      1
## 421         1         149          1     2.5        1      1
## 422         2          99          1     1.3        2      0
## 424         1         105          1     0.0        2      1
## 427         1         157          0     0.5        2      1
## 428         1         140          0     0.0        1      0
## 433         1          86          0     0.0        1      0
## 434         0          84          1     2.5        3      1
## 435         0         125          1     2.0        2      1
## 445         1         140          1     0.5        2      1
## 446         0         120          1     1.5        2      1
## 447         1         124          1     1.6        2      1
## 449         1         110          1     2.0        1      1
## 450         0         105          1     1.0        2      1
## 454         1         118          1     1.5        2      1
## 456         0         123          1     1.2        2      1
## 462         1         118          1     1.9        2      1
## 464         0         117          1     1.3        3      1
## 467         0         160          0     0.0        1      0
## 470         1          97          1     1.6        1      1
## 471         0         161          0     2.0        2      0
## 475         1         122          1     1.7        2      1
## 478         2         139          0     0.1        1      0
## 480         1         148          1     2.0        2      1
## 484         0         125          0     2.5        1      1
## 487         1         128          1     1.2        2      1
## 488         1         180          0     0.4        1      0
## 489         1         144          1     2.0        2      1
## 490         0         135          0     0.3        1      0
## 491         0         140          1     3.0        2      1
## 492         0         102          1     1.0        2      1
## 493         1         108          0     0.0        2      1
```

```
## 495                0            127                  1      1.7          2       1
## 496                0            110                  1      2.5          2       1
## 497                0            140                  1      1.0          2       1
## 498                0             69                  0      1.0          3       0
## 499                0            148                  1      3.0          3       1
## 500                1            130                  1      0.0          2       1
## 501                0            130                  1      1.0          2       1
## 502                0            140                  1      4.0          3       1
## 503                0            138                  1      2.0          2       1
## 504                1            140                  1      2.0          2       1
## 505                1            138                  0      0.2          1       0
## 506                0            112                  1      3.0          3       1
## 507                1            131                  1      1.2          2       1
## 508                0            112                  1      3.0          2       1
## 509                0             80                  1      0.0          1       0
## 511                0            110                  0      0.0          2       1
## 512                0            126                  0      0.3          1       0
## 513                1             88                  1      2.0          2       1
## 514                1            153                  0     -0.1          1       0
## 515                1            150                  1      1.3          2       1
## 518                0            132                  0      0.0          0       1
## 519                0            120                  1      1.5          2       1
## 521                1            121                  1      1.0          1       1
## 522                1            128                  0      0.5          2       0
## 523                1            135                  1      4.0          3       1
## 524                2            120                  1      1.0          1       1
## 525                0            117                  1      1.0          2       1
## 526                1            150                  0      0.0          1       0
## 527                0            144                  0      0.1          1       0
## 528                2            113                  1      1.7          2       1
## 529                0            135                  0      0.3          1       0
## 530                0            127                  1      1.5          2       1
## 531                0            109                  1      1.4          2       1
## 532                0            128                  1      1.1          2       1
## 533                1            115                  1      1.8          2       1
## 534                1            102                  0      0.0          2       1
## 535                1            140                  1      2.0          2       1
## 536                0            135                  1      2.5          3       1
## 539                1            130                  1      4.0          3       1
## 540                0            112                  1      2.0          2       1
## 541                2            100                  0      0.0          1       0
## 542                1            122                  1      1.2          2       1
## 543                2            120                  0      3.5          3       1
## 544                0            105                  1      1.5          2       1
## 545                1            129                  1      3.0          3       1
## 546                0            120                  1      0.0          1       0
## 547                1            139                  0      0.2          1       0
## 548                1            162                  0      0.0          2       1
## 549                1            100                  0      1.5          3       1
## 550                0            140                  0      1.5          1       1
```

```
## 551            1           135               0     0.2          1      0
## 552            0            73               0     2.0          2      1
## 553            2            86               0     0.0          1      0
## 554            0           108               1     1.8          2      1
## 555            0           116               1     1.8          2      1
## 556            1           160               0     0.3          1      0
## 557            1           118               1     0.0          2      1
## 558            0           112               1     2.0          3      0
## 559            1           122               1     1.8          2      1
## 560            1           124               1     1.4          2      1
## 561            0           102               1     4.0          3      1
## 562            1           137               0     0.2          1      0
## 563            1           141               0     0.1          1      0
## 564            0           154               1     2.0          2      0
## 565            1           126               1     1.1          2      1
## 566            1           160               1     2.0          2      1
## 567            1           115               1     1.7          2      1
## 568            0           128               1     1.5          2      0
## 569            1           115               1     0.0          2      1
## 570            0           105               1     1.5          3      1
## 571            0           110               1     2.5          2      1
## 572            1           119               1     2.0          3      1
## 573            0           109               1     1.5          2      1
## 574            1           135               1     0.5          2      1
## 575            2           130               0     1.5          2      1
## 576            1           112               1     1.5          2      1
## 577            0           126               1     1.2          2      1
## 578            1           120               1     3.0          2      1
## 579            0           110               1     1.9          2      1
## 580            2           119               1     3.0          3      1
## 581            1           110               1     1.8          2      1
## 582            2           130               1     1.0          2      1
## 583            0           159               1     1.5          1      1
## 584            2            84               1     0.0          2      1
## 585            2           126               0     0.3          1      0
## 586            1           116               1     1.5          2      1
## 587            1           120               0     0.8          2      1
## 588            0           122               1     2.0          2      1
## 589            2           165               0     1.0          2      0
## 590            1           122               1     2.0          2      1
## 591            0            94               0     0.0          2      1
## 592            1           133               0     0.2          1      0
## 593            1           110               0     0.0          1      0
## 594            2           150               1     2.0          3      1
## 595            2           130               0     0.0          2      1
## 596            2           113               1     1.0          1      1
## 597            2           140               1     0.5          2      1
## 598            2           100               0     0.0          2      1
## 599            1           136               0     0.2          1      0
## 600            2           127               1     1.7          3      1
```

```
## 601                 0             98                0      1.5          2       1
## 602                 1             96                1      1.0          2       0
## 603                 0            123                1      1.3          2       1
## 604                 0             98                1      0.0          2       1
## 605                 1            118                1      0.0          2       1
## 606                 0            112                1      1.5          3       1
## 607                 0            151                1      0.0          1       0
## 608                 2             96                0      1.0          1       0
## 609                 1            108                1      3.0          2       1
## 610                 1            128                1      1.5          2       1
## 611                 1            138                1      0.0          2       1
## 612                 0            126                0      0.0          2       1
## 613                 1            154                0      0.0          2       1
## 614                 1            137                0      0.2          1       0
## 615                 1            100                0      0.0          2       1
## 616                 2            135                0      0.3          1       0
## 617                 2             93                1      0.0          2       1
## 618                 2            109                0      2.4          2       1
## 619                 2            160                0      1.6          2       0
## 620                 0            141                0      0.3          1       1
## 621                 0            105                1      0.2          2       0
## 622                 2            121                1      0.2          1       0
## 623                 0            140                0      0.4          1       0
## 624                 2            142                1      0.6          2       1
## 625                 2            142                1      1.2          2       1
## 626                 2            170                0      1.2          2       1
## 627                 2            154                0      4.0          2       1
## 628                 0            161                0      0.5          2       0
## 629                 2            111                1      0.0          1       0
## 630                 2            180                0      0.0          1       0
## 631                 0            145                0      2.6          2       1
## 632                 2            159                0      0.0          1       0
## 633                 0            125                0      1.6          2       0
## 634                 0            120                1      1.8          2       1
## 635                 2            155                1      3.1          3       1
## 636                 2            144                1      1.8          2       0
## 637                 0            178                1      1.4          1       0
## 638                 2            129                1      2.6          2       1
## 639                 2            180                0      0.2          2       0
## 640                 0            181                0      1.2          2       0
## 641                 0            143                0      0.1          1       0
## 642                 2            159                1      0.0          1       0
## 643                 0            139                0      0.2          1       0
## 644                 2            152                1      0.0          2       0
## 645                 2            157                0      0.6          1       0
## 646                 2            165                0      2.5          2       1
## 647                 2            130                0      0.0          1       0
## 648                 2            150                0      0.4          2       1
## 649                 2            138                0      2.3          1       0
## 650                 0            170                0      0.0          1       0
```

```
## 651              2           140             1       3.4         3       1
## 652              2           126             1       0.9         2       1
## 653              2           150             1       0.0         1       1
## 654              2           138             1       1.9         1       1
## 655              2           125             0       0.0         1       1
## 656              0           150             0       0.0         1       0
## 657              2           186             0       0.0         1       0
## 658              0           181             0       0.0         1       1
## 659              0           163             0       0.0         1       0
## 660              0           179             1       0.4         1       0
## 661              0           156             0       0.0         1       0
## 662              0           134             0       2.2         2       1
## 663              2           165             0       0.0         1       0
## 664              2           126             0       0.8         1       1
## 665              2           177             0       0.0         1       1
## 666              0           120             1       0.0         2       1
## 667              2           114             0       1.0         2       1
## 668              0           125             1       1.8         2       1
## 669              0           184             0       0.0         1       0
## 670              2           157             0       0.8         1       0
## 671              0           179             0       0.0         1       0
## 672              2           175             0       0.6         2       0
## 673              0           168             0       0.0         1       0
## 674              2           125             1       3.6         2       1
## 675              0            96             0       0.0         1       0
## 676              0           143             1       0.0         2       1
## 677              2           103             0       1.4         2       1
## 678              0           173             0       0.2         1       0
## 679              0           142             1       1.2         2       1
## 680              0           169             0       0.0         1       0
## 681              0           171             0       0.9         1       0
## 682              2           150             0       2.3         3       0
## 683              2           112             1       0.6         2       1
## 684              2           186             1       0.0         1       0
## 685              2           152             0       0.0         1       1
## 686              0           149             0       0.3         2       0
## 687              0           152             0       0.0         1       1
## 688              0           140             1       3.6         2       1
## 689              0           163             1       0.6         1       0
## 690              2           143             0       0.0         1       0
## 691              1           116             0       1.1         2       0
## 692              0           142             0       0.3         1       0
## 693              2           147             1       0.0         2       1
## 694              2           148             1       3.0         2       0
## 695              0           179             0       0.0         1       0
## 696              0           173             0       0.0         2       0
## 697              0           178             0       0.8         1       0
## 698              0           105             0       2.0         2       1
## 699              0           130             1       1.6         2       1
## 700              2           111             1       0.8         1       1
```

```
## 701                  2            168                0      2.0          2      0
## 702                  0            126                1      1.5          2      0
## 703                  2            178                0      0.8          1      0
## 704                  2            140                0      0.0          1      0
## 705                  2            145                0      4.2          3      0
## 706                  0            163                0      0.0          1      0
## 707                  2            128                0      2.6          2      1
## 708                  0            164                1      0.0          1      0
## 709                  2            169                0      0.0          1      1
## 710                  2            109                1      2.2          2      1
## 711                  2            108                1      0.0          2      1
## 712                  0            168                0      1.0          1      1
## 713                  2            118                1      1.0          2      1
## 714                  2            151                0      0.4          2      0
## 715                  0            156                0      0.1          1      1
## 716                  0            133                0      0.2          1      0
## 717                  0            162                0      1.1          1      0
## 718                  0            175                0      0.6          2      0
## 719                  0             71                0      1.0          2      1
## 720                  0            163                0      0.0          1      0
## 721                  2            124                0      1.0          2      1
## 722                  2            147                0      1.4          2      1
## 723                  2            166                0      0.5          2      1
## 724                  0            143                1      1.2          2      0
## 725                  2            157                0      2.6          2      1
## 726                  0            162                1      0.0          1      1
## 727                  0            138                0      0.0          2      0
## 728                  1            117                1      3.4          2      1
## 729                  0            153                0      0.0          1      0
## 730                  2            161                0      0.0          1      1
## 731                  0            170                0      0.0          1      0
## 732                  0            162                0      0.0          1      0
## 733                  0            162                0      0.0          2      0
## 734                  2            144                0      0.8          1      1
## 735                  2            133                1      4.0          3      1
## 736                  0            114                0      2.6          3      0
## 737                  2            103                1      1.6          3      1
## 738                  0            139                0      2.0          2      1
## 739                  2            116                1      3.2          2      1
## 740                  0             88                1      1.2          2      1
## 741                  2            151                0      0.8          1      0
## 742                  2            152                0      0.5          3      0
## 743                  0            163                0      0.0          1      0
## 744                  0             99                1      1.8          2      1
## 745                  2            169                0      0.1          2      0
## 746                  0            158                0      0.8          1      0
## 747                  0            160                1      1.4          1      1
## 748                  0            169                1      1.8          2      1
## 749                  2            132                1      0.1          1      1
## 750                  0            178                0      0.0          1      0
```

```
## 751                2             96               1      2.2         3      1
## 752                2            165               0      1.6         1      0
## 753                2            160               1      1.4         3      0
## 754                0            172               0      0.0         1      0
## 755                2            144               1      1.2         2      1
## 756                0            192               0      0.7         1      0
## 757                0            168               1      0.0         1      0
## 758                2            132               0      2.0         2      1
## 759                2            182               0      0.0         1      0
## 760                0            163               0      0.6         2      1
## 761                2            125               1      1.4         1      0
## 762                2            195               0      0.0         1      1
## 763                0             95               1      2.0         2      1
## 764                0            160               0      0.0         1      1
## 765                2            114               1      2.0         2      1
## 766                2            173               0      3.2         1      1
## 767                2            172               1      0.0         1      0
## 768                0            179               0      0.0         1      0
## 769                0            158               0      1.6         2      0
## 770                2            167               0      0.0         1      0
## 771                0            122               0      2.0         2      0
## 772                2            149               0      0.5         1      0
## 773                0            172               0      0.0         1      0
## 774                0            111               1      5.6         3      1
## 775                2            170               0      0.0         1      0
## 776                2            162               0      1.9         2      0
## 777                0            165               1      1.0         2      1
## 778                0            182               1      3.8         2      1
## 779                0            154               1      1.4         2      1
## 780                0            155               0      0.0         1      0
## 781                2            130               1      3.0         2      1
## 782                0            161               0      0.0         1      0
## 783                0            154               1      0.0         1      0
## 784                2            159               0      0.0         1      0
## 785                2            152               0      1.2         3      0
## 786                2            152               1      0.2         2      0
## 787                2            174               0      1.4         2      1
## 788                2            131               0      0.1         2      0
## 789                2            146               0      2.0         2      1
## 790                2            125               1      0.9         2      1
## 791                2            115               0      1.5         2      0
## 792                2            174               0      0.0         1      0
## 793                0            106               0      1.9         2      1
## 794                0            122               1      4.2         2      1
## 795                0            147               0      3.6         2      1
## 796                0            163               0      0.2         2      1
## 797                0            163               0      0.0         1      0
## 798                0            194               0      0.8         3      0
## 799                2            150               1      1.9         2      1
## 800                2            158               0      0.0         1      1
```

```
## 801                   2              122               0      0.6         2       0
## 802                   2              173               0      0.0         1       0
## 803                   0              162               0      1.9         1       0
## 804                   2              105               1      2.1         2       1
## 805                   0              147               0      0.1         1       0
## 806                   2              157               0      1.2         2       0
## 807                   0              112               1      2.9         2       1
## 808                   0              160               0      1.2         1       0
## 809                   0              125               1      2.6         3       1
## 810                   0              156               0      0.0         1       0
## 811                   2              156               1      0.0         1       1
## 812                   0              175               0      0.0         1       0
## 813                   2              161               0      1.4         2       0
## 814                   2              122               0      1.0         2       0
## 815                   0              158               0      1.6         2       0
## 816                   0              151               0      1.8         1       0
## 817                   2              162               1      0.0         1       1
## 818                   0              151               0      1.0         1       0
## 819                   2              171               0      0.0         1       1
## 820                   2              141               1      2.8         2       1
## 821                   0              173               1      1.6         1       1
## 822                   2              145               1      0.8         2       1
## 823                   0              178               0      1.2         2       0
## 824                   0              160               0      0.0         1       0
## 825                   2              154               1      0.6         2       0
## 826                   0              131               1      1.8         2       1
## 827                   0              187               0      3.5         3       0
## 828                   2              159               0      0.2         2       1
## 829                   2              166               0      2.4         2       0
## 830                   0              165               0      0.2         2       0
## 831                   2              131               1      2.2         2       1
## 832                   2              202               0      0.0         1       0
## 833                   2              172               0      1.4         1       0
## 834                   2              172               0      0.0         1       0
## 835                   0              154               1      0.0         1       0
## 836                   2              147               0      0.4         2       0
## 837                   0              170               0      0.0         1       0
## 838                   0              126               1      2.8         2       1
## 839                   2              127               0      2.8         2       1
## 840                   0              174               0      1.6         1       0
## 841                   2              132               1      1.8         1       1
## 842                   0              182               0      1.4         1       0
## 843                   0              132               0      0.0         2       0
## 844                   0               97               0      1.2         2       1
## 845                   2              136               1      3.0         2       1
## 846                   2              162               0      1.0         1       0
## 847                   2              190               0      0.0         2       0
## 848                   2              146               1      1.0         2       1
## 849                   0              140               0      1.2         2       1
## 850                   2              185               0      0.0         1       0
```

```
## 851          0         161           1     0.0       1      1
## 852          0         146           0     1.8       2      0
## 853          2         145           0     6.2       3      1
## 854          2         160           0     0.0       1      0
## 855          2         120           1     2.5       2      1
## 856          2         156           0     0.0       1      0
## 857          0         172           0     0.2       1      0
## 858          2         150           1     1.6       2      1
## 859          2         182           0     0.0       1      0
## 860          2         143           0     0.4       2      0
## 861          2         160           0     3.6       3      1
## 862          2         142           0     1.5       1      0
## 863          0         144           1     1.4       1      1
## 864          2         158           0     0.6       1      1
## 865          0         148           0     0.8       1      0
## 866          2         155           0     3.0       2      1
## 867          2         142           1     2.8       2      1
## 868          0         113           0     1.4       2      1
## 869          2         188           0     0.0       1      0
## 870          2         153           0     0.0       1      1
## 871          0         123           0     0.6       1      0
## 872          0         157           0     1.6       1      0
## 873          0         162           0     0.4       1      0
## 874          0         137           1     1.0       2      0
## 875          0         132           1     1.2       2      1
## 876          0         158           0     0.0       1      1
## 877          0         171           0     1.5       1      0
## 878          0         172           0     0.0       1      0
## 879          2         132           1     2.4       2      1
## 880          2         160           0     1.8       2      1
## 881          0         171           0     0.6       1      0
## 882          0         168           0     1.0       3      1
## 883          0         162           0     0.5       1      0
## 884          0         173           0     0.0       1      0
## 885          2         153           0     1.3       2      0
## 886          0         148           0     0.4       2      0
## 887          2         108           1     1.5       2      1
## 888          2         150           0     2.3       3      0
## 889          2         108           1     1.5       2      1
## 890          2         129           1     2.6       2      1
## 891          0         187           0     3.5       3      0
## 892          2         172           0     1.4       1      0
## 893          0         178           0     0.8       1      0
## 894          2         160           0     3.6       3      1
## 895          0         163           1     0.6       1      0
## 896          2         147           0     1.4       2      1
## 897          2         155           1     3.1       3      1
## 898          0         148           0     0.4       2      0
## 899          2         153           0     1.3       2      0
## 900          2         142           1     0.6       2      1
```

```
## 901                 0            173                0      0.0           1       0
## 902                 0            162                0      0.5           1       0
## 903                 0            174                0      1.6           1       0
## 904                 0            168                0      1.0           3       1
## 905                 0            160                0      1.2           1       0
## 906                 0            139                0      0.2           1       0
## 907                 0            171                0      0.6           1       0
## 908                 2            144                1      1.8           2       0
## 909                 2            162                0      1.0           1       0
## 910                 2            160                0      1.8           2       1
## 911                 2            173                0      3.2           1       1
## 912                 2            132                1      2.4           2       1
## 913                 0            158                0      1.6           2       0
## 914                 0            172                0      0.0           1       0
## 915                 0            114                0      2.6           3       0
## 916                 0            171                0      1.5           1       0
## 917                 2            114                1      2.0           2       1
## 918                 0            151                0      1.8           1       0
## 919                 0            160                1      1.4           1       1
## 920                 0            158                0      0.0           1       1
## 921                 0            161                0      0.5           2       0
## 922                 0            179                1      0.4           1       0
## 923                 0            178                0      0.0           1       0
## 924                 2            120                1      2.5           2       1
## 925                 2            112                1      0.6           2       1
## 926                 0            132                1      1.2           2       1
## 927                 0            137                1      1.0           2       0
## 928                 2            114                0      1.0           2       1
## 929                 0            178                1      1.4           1       0
## 930                 0            162                0      0.4           1       0
## 931                 0            157                0      1.6           1       0
## 932                 2            169                0      0.0           1       1
## 933                 2            165                0      2.5           2       1
## 934                 0            123                0      0.6           1       0
## 935                 2            128                0      2.6           2       1
## 936                 2            157                0      0.8           1       0
## 937                 2            152                0      1.2           3       0
## 938                 0            168                0      0.0           1       0
## 939                 0            140                0      0.4           1       0
## 940                 2            153                0      0.0           1       1
## 941                 2            188                0      0.0           1       0
## 942                 0            144                1      1.4           1       1
## 943                 2            109                1      2.2           2       1
## 944                 0            163                0      0.6           2       1
## 945                 2            158                0      0.0           1       1
## 946                 2            152                0      0.5           3       0
## 947                 2            125                1      1.4           1       0
## 948                 0            142                1      1.2           2       1
## 949                 2            160                1      1.4           3       0
## 950                 2            131                1      2.2           2       1
```

```
## 951                0             170               0      0.0          1       0
## 952                0             113               0      1.4          2       1
## 953                2             142               1      2.8          2       1
## 954                2             155               0      3.0          2       1
## 955                2             165               0      1.6          1       0
## 956                2             140               1      3.4          3       1
## 957                0             147               0      3.6          2       1
## 958                0             148               0      0.8          1       0
## 959                0             163               0      0.2          2       1
## 960                0              99               1      1.8          2       1
## 961                2             158               0      0.6          1       1
## 962                2             177               0      0.0          1       1
## 963                2             151               0      0.8          1       0
## 964                2             141               1      2.8          2       1
## 965                2             142               0      1.5          1       0
## 966                2             180               0      0.2          2       0
## 967                2             111               1      0.8          1       1
## 968                2             148               1      3.0          2       0
## 969                2             143               0      0.4          2       0
## 970                2             182               0      0.0          1       0
## 971                2             150               1      1.6          2       1
## 972                0             172               0      0.2          1       0
## 973                2             180               0      0.0          1       0
## 974                2             156               0      0.0          1       0
## 975                2             115               0      0.0          1       0
## 976                2             160               0      0.0          1       0
## 977                2             149               0      0.5          1       0
## 978                2             151               0      0.4          2       0
## 979                2             145               0      6.2          3       1
## 980                0             146               0      1.8          2       0
## 981                0             175               0      0.6          2       0
## 982                2             172               0      0.0          1       0
## 983                0             161               1      0.0          1       1
## 984                2             142               1      1.2          2       1
## 985                2             157               0      2.6          2       1
## 986                0             158               0      0.8          1       0
## 987                2             186               0      0.0          1       0
## 988                2             185               0      0.0          1       0
## 989                2             174               0      0.0          1       0
## 990                2             159               0      0.0          1       0
## 991                2             130               0      0.0          1       0
## 992                0             139               0      2.0          2       1
## 993                0             156               0      0.0          1       0
## 994                0             162               1      0.0          1       1
## 995                2             150               0      0.4          2       1
## 996                0             140               1      3.6          2       1
## 997                0             140               0      1.2          2       1
## 998                2             146               1      1.0          2       1
## 999                2             144               1      1.2          2       1
## 1000               2             190               0      0.0          2       0
```

```
## 1001               2             136                  1      3.0         2       1
## 1002               0              97                  0      1.2         2       1
## 1003               0             132                  0      0.0         2       0
## 1004               2             165                  0      0.0         1       0
## 1005               0             182                  0      1.4         1       0
## 1006               2             132                  1      1.8         1       1
## 1007               2             127                  0      2.8         2       1
## 1008               2             150                  1      0.0         1       1
## 1009               2             154                  0      4.0         2       1
## 1010               0             143                  1      1.2         2       0
## 1011               0             111                  1      5.6         3       1
## 1012               2             174                  0      1.4         2       1
## 1013               2             175                  0      0.6         2       0
## 1014               2             133                  1      4.0         3       1
## 1015               0             126                  1      2.8         2       1
## 1016               0             170                  0      0.0         1       0
## 1017               0             163                  0      0.0         1       0
## 1018               2             147                  0      0.4         2       0
## 1019               0             154                  1      0.0         1       0
## 1020               2             202                  0      0.0         1       0
## 1021               2             186                  1      0.0         1       0
## 1022               0             165                  0      0.2         2       0
## 1023               2             161                  0      1.4         2       0
## 1024               0             125                  1      2.6         3       1
## 1025               2             103                  0      1.4         2       1
## 1026               0             130                  1      1.6         2       1
## 1027               2             166                  0      2.4         2       0
## 1028               0             164                  1      0.0         1       0
## 1029               2             159                  0      0.2         2       1
## 1030               0             184                  0      0.0         1       0
## 1031               0             131                  1      1.8         2       1
## 1032               2             154                  1      0.6         2       0
## 1033               0             152                  0      0.0         1       1
## 1034               2             124                  0      1.0         2       1
## 1035               0             179                  0      0.0         1       0
## 1036               2             170                  0      0.0         1       0
## 1037               0             160                  0      0.0         1       0
## 1038               0             178                  0      1.2         2       0
## 1039               2             122                  0      0.6         2       0
## 1040               2             160                  0      1.6         2       0
## 1041               2             145                  1      0.8         2       1
## 1042               2              96                  1      2.2         3       1
## 1043               2             109                  0      2.4         2       1
## 1044               0             173                  1      1.6         1       1
## 1045               2             171                  0      0.0         1       1
## 1046               2             170                  0      1.2         2       1
## 1047               0             151                  0      1.0         1       0
## 1048               0             156                  0      0.0         1       0
## 1049               2             162                  1      0.0         1       1
## 1050               0             158                  0      1.6         2       0
```

```
## 1051            2           122            0     1.0        2      0
## 1052            0           175            0     0.0        1      0
## 1053            0           168            1     0.0        1      0
## 1054            0           169            0     0.0        1      0
## 1055            2           159            1     0.0        1      0
## 1056            2           156            1     0.0        1      1
## 1057            0           138            0     0.0        2      0
## 1058            0           112            1     2.9        2      1
## 1059            2           111            1     0.0        1      0
## 1060            0           143            1     0.0        2      1
## 1061            2           157            0     1.2        2      0
## 1062            2           132            0     2.0        2      1
## 1063            0            88            1     1.2        2      1
## 1064            0           147            0     0.1        1      0
## 1065            2           105            1     2.1        2      1
## 1066            0           162            0     1.9        1      0
## 1067            2           173            0     0.0        1      0
## 1068            2           166            0     0.5        2      1
## 1069            2           150            1     1.9        2      1
## 1070            2           178            0     0.8        1      0
## 1071            2           145            0     4.2        3      0
## 1072            2           161            0     0.0        1      1
## 1073            0           179            0     0.0        1      0
## 1074            0           194            0     0.8        3      0
## 1075            0           120            1     0.0        2      1
## 1076            2           195            0     0.0        1      1
## 1077            2           146            0     2.0        2      1
## 1078            0           163            0     0.0        1      0
## 1079            0           122            1     4.2        2      1
## 1080            2           143            1     0.1        2      1
## 1081            0           106            0     1.9        2      1
## 1082            2           115            0     1.5        2      0
## 1083            2           125            1     0.9        2      1
## 1084            2           131            0     0.1        2      0
## 1085            2           152            1     0.2        2      0
## 1086            0           162            0     1.1        1      0
## 1087            2           125            0     0.0        1      1
## 1088            2           159            0     0.0        1      0
## 1089            0           154            1     0.0        1      0
## 1090            0           173            0     0.2        1      0
## 1091            0           133            0     0.2        1      0
## 1092            0           161            0     0.0        1      0
## 1093            2           147            1     0.0        2      1
## 1094            2           130            1     3.0        2      1
## 1095            2           126            1     0.9        2      1
## 1096            0           155            0     0.0        1      0
## 1097            0           154            1     1.4        2      1
## 1098            0           170            0     0.0        1      0
## 1099            0           182            1     3.8        2      1
## 1100            2           168            0     2.0        2      0
```

```
## 1101            0            165               1      1.0          2       1
## 1102            0            160               0      0.0          1       1
## 1103            2            162               0      1.9          2       0
## 1104            0            172               0      0.0          1       0
## 1105            2            152               1      0.0          2       0
## 1106            0            122               0      2.0          2       0
## 1107            2            182               0      0.0          1       0
## 1108            2            172               1      0.0          1       0
## 1109            2            167               0      0.0          1       0
## 1110            0            179               0      0.0          1       0
## 1111            0             95               1      2.0          2       1
## 1112            0            169               1      1.8          2       1
## 1113            0            192               0      0.7          1       0
## 1114            0            143               0      0.1          1       0
## 1115            0            172               0      0.0          1       0
## 1116            2            108               1      0.0          2       1
## 1117            2            132               1      0.1          1       1
## 1118            2            169               0      0.1          2       0
## 1119            1            117               1      3.4          2       1
## 1120            2            126               0      0.8          1       1
## 1121            2            121               1      0.2          1       0
## 1122            0            163               0      0.0          1       0
## 1123            2            116               1      3.2          2       1
## 1124            2            103               1      1.6          3       1
## 1125            2            144               0      0.8          1       1
## 1126            0            162               0      0.0          2       0
## 1127            0            162               0      0.0          1       0
## 1128            0            153               0      0.0          1       0
## 1129            0            163               0      0.0          1       0
## 1130            0            163               0      0.0          1       0
## 1131            0            145               0      2.6          2       1
## 1132            0             96               0      0.0          1       0
## 1133            0             71               0      1.0          2       1
## 1134            0            156               0      0.1          1       1
## 1135            2            118               1      1.0          2       1
## 1136            0            168               0      1.0          1       1
## 1137            2            140               0      0.0          1       0
## 1138            0            126               1      1.5          2       0
## 1139            0            105               0      2.0          2       1
## 1140            0            105               1      0.2          2       0
## 1141            2            157               0      0.6          1       0
## 1142            0            181               0      1.2          2       0
## 1143            0            173               0      0.0          2       0
## 1144            0            142               0      0.3          1       0
## 1145            1            116               0      1.1          2       0
## 1146            2            143               0      0.0          1       0
## 1147            0            141               0      0.3          1       1
## 1148            0            149               0      0.3          2       0
## 1149            2            152               0      0.0          1       1
## 1150            0            171               0      0.9          1       0
```

```
## 1151          0          169              0     0.0        1      0
## 1152          2          125              1     3.6        2      1
## 1153          0          125              1     1.8        2      1
## 1154          0          156              1     1.0        2      1
## 1155          0          134              0     2.2        2      1
## 1156          0          181              0     0.0        1      1
## 1157          0          150              0     0.0        1      0
## 1158          2          138              1     1.9        1      1
## 1159          2          138              0     2.3        1      0
## 1160          0          120              1     1.8        2      1
## 1161          0          125              0     1.6        2      0
## 1162          0          162              0     0.8        1      1
## 1163          2          155              0     0.6        2      0
## 1164          2          152              0     0.0        2      0
## 1165          0          152              0     0.0        2      0
## 1166          2          164              0     0.0        1      1
## 1167          0          131              0     0.6        2      0
## 1168          0          143              1     3.0        2      1
## 1169          0          179              0     0.0        1      0
## 1170          1          130              1     2.0        2      1
## 1171          0          174              0     0.0        1      0
## 1172          0          161              0     0.0        1      1
## 1173          1          140              0     4.4        3      1
## 1174          2          146              1     2.8        2      1
## 1175          0          144              0     0.4        2      0
## 1176          2          163              0     0.0        1      0
## 1177          0          169              0     0.0        3      0
## 1178          2          150              0     0.8        2      1
## 1179          0          166              0     1.2        1      0
## 1180          0          144              1     2.8        3      1
## 1181          2          144              1     4.0        1      1
## 1182          0          136              1     0.0        2      1
## 1183          0          182              0     0.0        1      0
## 1184          2           90              0     1.0        2      1
## 1185          0          123              1     0.2        2      1
## 1186          0          132              0     1.2        2      1
## 1187          0          141              0     3.4        2      1
## 1188          0          115              1     1.2        2      1
## 1189          2          174              0     0.0        2      1
## 1190          0          173              0     0.0        1      0
```

```
dim(heart)
```

```
## [1] 1190   12
```

```
dim(heart_clean)
```

```
## [1] 1018   12
```

```
colnames(heart_clean)
```

```
##  [1] "age"                "sex"                "chest.pain.type"
##  [4] "resting.bp.s"       "cholesterol"        "fasting.blood.sugar"
##  [7] "resting.ecg"        "max.heart.rate"     "exercise.angina"
## [10] "oldpeak"            "ST.slope"           "target"
```

I am going to finish this project in Google colab and the column names would be a problem "the name separated by"."". I am going to rename the ones that is problematic.

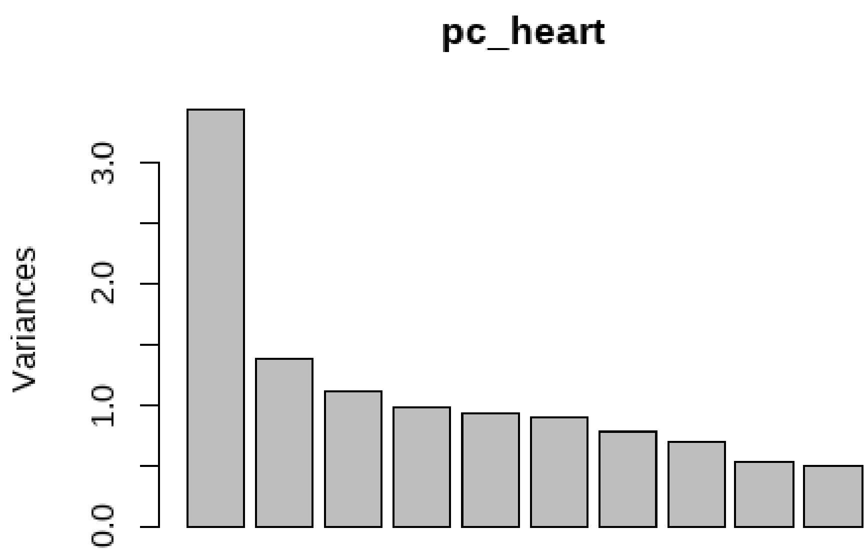
```
colnames(heart_clean)[colnames(heart_clean) ==  "chest.pain.type" ] <-
"chest_pain_type"
colnames(heart_clean)[colnames(heart_clean) == "resting.bp.s" ] <-
"resting_bp_s"
colnames(heart_clean)[colnames(heart_clean) ==  "fasting.blood.sugar" ] <-
"fasting_blood_sugar"
colnames(heart_clean)[colnames(heart_clean) ==  "resting.ecg" ] <-
"resting_ecg"
colnames(heart_clean)[colnames(heart_clean) ==  "max.heart.rate" ] <-
"max_heart_rate"
colnames(heart_clean)[colnames(heart_clean) ==  "exercise.angina" ] <-
"exercise_angina"
colnames(heart_clean)[colnames(heart_clean) ==  "ST.slope" ] <- "ST_slope"

colnames(heart_clean)

##  [1] "age"                "sex"                "chest_pain_type"
##  [4] "resting_bp_s"       "cholesterol"        "fasting_blood_sugar"
##  [7] "resting_ecg"        "max_heart_rate"     "exercise_angina"
## [10] "oldpeak"            "ST_slope"           "target"

# perform PCA on the swiss dataset
#   note: variables are centered and scaled before analysis
pc_heart <- prcomp(heart_clean, center = T, scale. = T)

# inspect the attributes of the PCA object returned by prcomp
attributes(pc_heart)

## $names
## [1] "sdev"     "rotation" "center"   "scale"    "x"
##
## $class
## [1] "prcomp"

# see value section of the help for the prcomp for more details
help(prcomp)

## starting httpd help server ... done

# calculate the proportion of exaplained variance (PEV) from the std values
pc_heart_var <- pc_heart$sdev^2
pc_heart_var
```

```
##  [1] 3.4316643 1.3794357 1.1074205 0.9775069 0.9334707 0.8922695 0.7836522
##  [8] 0.6976649 0.5345477 0.4964314 0.4178373 0.3480988
```

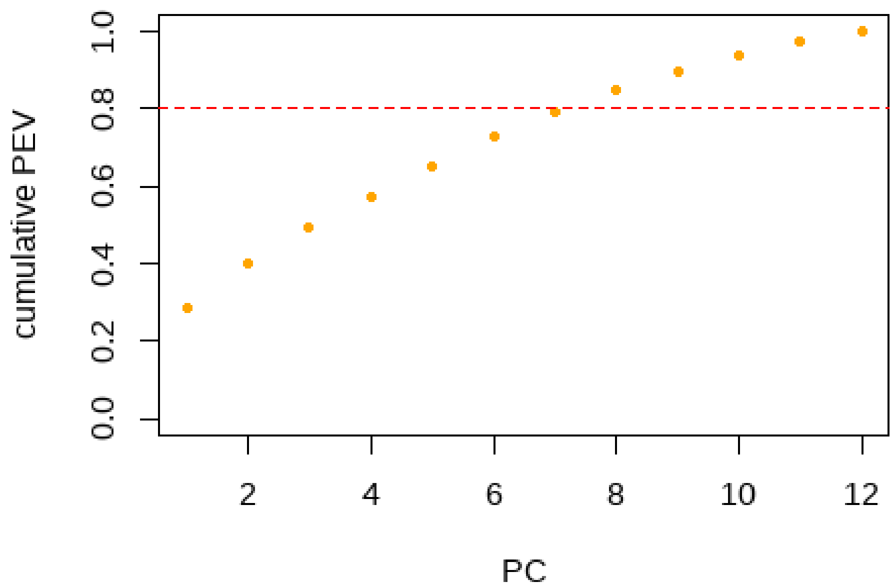
```
pc_heart_PEV <- pc_heart_var / sum(pc_heart_var)
pc_heart_PEV
```

```
##  [1] 0.28597203 0.11495298 0.09228504 0.08145891 0.07778923 0.07435579
##  [7] 0.06530435 0.05813874 0.04454564 0.04136928 0.03481978 0.02900824
```

```
# plot the variance per PC
#   note: this can be done using the plot function on the prcomp object
plot(pc_heart)
```



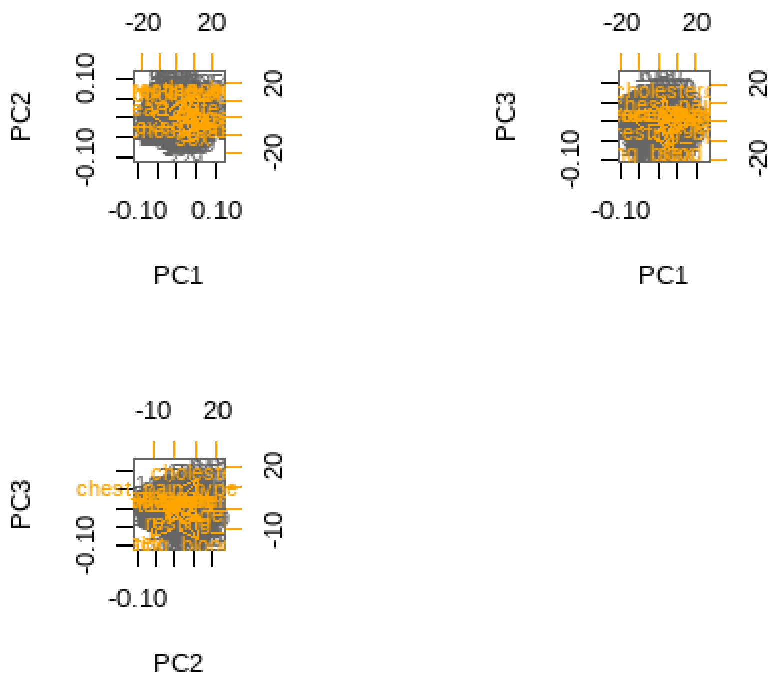

```
# plot the cumulative value of PEV for increasing number of additional PCs
#   note: add an 80% threshold line to inform the feature extraction
#     according to the plot the first 3 PCs should be selected
opar <- par(no.readonly = TRUE)
plot(
  cumsum(pc_heart_PEV),
  ylim = c(0,1),
  xlab = 'PC',
  ylab = 'cumulative PEV',
  pch = 20,
  col = 'orange'
)
abline(h = 0.8, col = 'red', lty = 'dashed')
```




```
par(opar)

# get and inspect the loadings for each PC
#   note: loadings are reported as a rotation matrix (see lecture)
pc_heart_loadings <- pc_heart$rotation
pc_heart_loadings

##                          PC1          PC2          PC3         PC4
## age                0.2733733  0.397598231 -0.141652230  0.19529925
## sex                0.1541771 -0.355089865 -0.526270396 -0.26079461
## chest_pain_type    0.3112215 -0.223569389  0.247590096  0.03588838
## resting_bp_s       0.1703685  0.425028899 -0.214305178  0.28336686
## cholesterol        0.0798028  0.370361200  0.507975480  0.13864458
## fasting_blood_sugar 0.1164798  0.370155677 -0.540013003 -0.01143243
## resting_ecg        0.1135241  0.389671534  0.094829988 -0.73973835
## max_heart_rate    -0.3336951  0.111655925  0.078366160 -0.41983066
## exercise_angina    0.3855692 -0.172945498  0.076334955  0.07731400
## oldpeak            0.3774355 -0.007807335  0.130638927 -0.17752886
## ST_slope           0.3964217 -0.033683822  0.089568405 -0.14910242
## target             0.4279776 -0.124878756  0.006586668 -0.09854191
##                            PC5         PC6          PC7          PC8
## age               -0.005911474  0.47925309 -0.159980892  0.287816267
## sex                0.245521240 -0.29965695 -0.351125227  0.384380295
## chest_pain_type    0.405745676  0.13704073 -0.073143968 -0.523093061
## resting_bp_s      -0.284882983 -0.37835509 -0.505038659 -0.369835692
## cholesterol        0.426670065 -0.45741194  0.016758531  0.418394452
## fasting_blood_sugar 0.314963579 -0.11772110  0.622345480 -0.186710522
```

```
## resting_ecg          0.141424788  0.29050027 -0.244822752 -0.076559725
## max_heart_rate      -0.101583821 -0.39791325  0.045176620 -0.251675134
## exercise_angina      0.117142018 -0.10117563  0.007628128 -0.230025490
## oldpeak             -0.485074595 -0.12966873  0.140633998  0.096110603
## ST_slope            -0.351332310 -0.07609459  0.345884782  0.133198030
## target               0.099362250 -0.14120650 -0.040704516  0.001267336
##                              PC9         PC10         PC11        PC12
## age                 -0.300981742  0.500465060  0.017429723 -0.17165633
## sex                 -0.105571414  0.006783688 -0.235594271 -0.13175026
## chest_pain_type     -0.479944382 -0.101847357 -0.274820171 -0.10925830
## resting_bp_s         0.016504087 -0.206253531 -0.003741695 -0.07156292
## cholesterol         -0.006274670 -0.044435869 -0.102242089 -0.01129295
## fasting_blood_sugar -0.005968049 -0.043669919 -0.081378509  0.11778076
## resting_ecg          0.259963360 -0.198943237 -0.027595983  0.03083796
## max_heart_rate      -0.318718613  0.552039754  0.100441327 -0.20815401
## exercise_angina      0.668526795  0.509255946 -0.087202664 -0.13718261
## oldpeak             -0.157249538  0.118189975 -0.453673151  0.53221835
## ST_slope            -0.055993950 -0.272638602  0.102844954 -0.67588035
## target              -0.153679420  0.026927598  0.785318277  0.34488948

# plot the loadings for the first three PCs as a barplot
#   note: two vectors for colours and labels are created for convenience
#     for details on the other parameters see the help for barplot and legend
opar <- par(no.readonly = TRUE)
colvector = c('red', 'orange', 'yellow', 'green', 'cyan', 'blue')
labvector = c('PC1', 'PC2', 'PC3')
barplot(
  pc_heart_loadings[,c(1:3)],
  beside = T,
  yaxt = 'n',
  names.arg = labvector,
  col = colvector,
  ylim = c(-1,1),
  border = 'white',
  ylab = 'loadings'
)
axis(2, seq(-1,1,0.1))
legend(
  'bottomright',
  bty = 'n',
  col = colvector,
  pch = 15,
  row.names(pc_heart_loadings)
)
```


```
par(opar)

# generate a biplot for each pair of important PCs (and show them on the same
page)
#   note: the option choices is used to select the PCs - default is 1:2
opar <- par(no.readonly = TRUE)
par(mfrow = c(2,2))
biplot(
  pc_heart,
  scale = TRUE,
  col = c('grey40','orange')
)
biplot(
  pc_heart,
  choices = c(1,3),
  scale = TRUE,
  col = c('grey40','orange')
)
biplot(
  pc_heart,
  choices = c(2,3),
  scale = TRUE,
  col = c('grey40','orange')
)
par(opar)
```



Saving clean data to csv

```
write.csv(heart_clean, "Clean_heart_data.csv")
```

Format of the Project

1. Data Decscritption and Research Question
2. Data Preparation and Clean(done on Rstudio)
3. Exploratory Data Analysis - Some done in RStudio and the rest will be done on this note book.
4. Machine Learning and Prediction.
5. Deep Learning Prediction
6. Performance Evaluation and Comparision of Methods
7. Data Management Plan and author contributioon

1. Data Description and Research

This notebook looks into using various Python-based machine-learning and data science libraries in attemtp to build a machine learning model capabale of predictiing whether or not someone has heart disease based on thier medical attritbute.

Problem Definition

In a statement:

> Given clinical parameters about a patient, can we predict whether our not they have heart disease. Given that the target is binary it means it is a binary classification problem

Data

> This heart disease dataset is curated by combining 5 popular heart disease datasets already available independently but not combined before. In this dataset, 5 heart datasets are combined over 11 common features which makes it the largest heart disease dataset available so far for research purposes. The five datasets used for its curation are:

- Cleveland
- Hungarian
- Switzerland
- Long Beach VA
- Statlog (Heart) Data Set.

The original data came from the Cleavland data from the UCI Machine Learning Repository.https://ieee-dataport.org/open-access/heart-disease-dataset-comprehensive

Evaluation

> If we can reach 90% accuracy at predicting whether or not a patient has heart disease during the proof of concept, we'll pursue the project.

Features

Create Data Dictionary

1. age - Age, age in years(data type - numeric)
2. sex - Sex(data type - binary):
    - 1 = male;
    - 0 = female.
3. chest pain type - chest pain type(data type - nominal):
    - 1: Typical angina: chest pain related decrease blood supply to the heart;
    - 2: Atypical angina: chest pain not related to heart;
    - 3: Non-anginal pain: typically esophageal spasms (non heart related);
    - 4: Asymptomatic: chest pain not showing signs of disease.
4. resting blood pressure - resting bp s(in mm Hg on admission to the hospital), (data type numeric):
    - anything above 130-140 is typically cause for concern.
5. serum cholesterol - Cholesterol in mg/dl(data type numeric):
    - serum = LDL + HDL + .2 * triglycerides;
    - above 200 is cause for concern;
6. fasting blood sugar - fasting blood sugar(1,0 > 120 mg/dl), (data type - binary):
    - 1 = true;
    - 0 = false;
    - '>126' mg/dL signals diabetes.
7. resting electrocardiogram results -restecg results(data type - nominal):
    - 0: Nothing to note;
    - 1: ST-T Wave abnormality:
        - can range from mild symptoms to severe problems;
        - signals non-normal heart beat.

- 2: Possible or definite left ventricular hypertrophy:
  - Enlarged heart's main pumping chamber.

8. maximum heart rate achieved - max heart rate(71 - 202), (data type - numeric)
9. exercise induced angina - exercise angina(data type binary):
   - 1 = yes;
   - 0 = no.
10. oldpeak =ST - oldpeak(depression induced by exercise relative to rest), (data type - numeric):
    - looks at stress of heart during excercise;
    - unhealthy heart will stress more.
11. the slope of the peak exercise ST segment - ST slope(data type - nominal):
    - 1: Upsloping: better heart rate with excercise (uncommon);
    - 2: Flatsloping: minimal change (typical healthy heart);
    - 3: Downslopins: signs of unhealthy heart.
12. target - have disease or not (1=yes, 0=no) (= the predicted attribute) (data type - binary)

3. 3. Evaluation Data Analyis

```
# Importing all the tools I need
# Regular EDA and plotting libraries
import tensorflow as tf
import numpy as np # np is short for numpy
import pandas as pd # pandas is so commonly used, it's shortened to pd
import matplotlib.pyplot as plt
import seaborn as sns # seaborn gets shortened to sns

# We want our plots to appear in the notebook
%matplotlib inline

## Models
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier as KNN #helps for classification
from sklearn.ensemble import RandomForestClassifier
from sklearn.preprocessing import OneHotEncoder #helps for label one-hot encoding
from sklearn.preprocessing import LabelEncoder #helps to encode bool/text variables to be num

## Model evaluators
from sklearn.model_selection import train_test_split, cross_val_score #helps to split trainin
from sklearn.metrics import confusion_matrix, classification_report
from sklearn.metrics import precision_score, recall_score, f1_score
from sklearn.metrics import plot_roc_curve
from sklearn.metrics import accuracy_score #helps to evaluate the prediction accuracy
```

```
#from sklearn.model_selection import train_test_split
```

Load the data

```
from google.colab import drive # Mount the google drive for data loading
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
# After completing stage one and two I saved it to a csv file and uploaded to my drive to con
df = pd.read_csv("/content/drive/MyDrive/Integrated assesment/Clean_heart_data.csv")
df.shape #rows and columns
```

```
(1018, 13)
```

Data Exploration (exploratory data analysis or EDA)

My goal here is to find out more about the data and become a subject matter export on the dataset I am working with.

1. What question(s) are you trying to solve?
2. What kind of data do we have and how do we treat different types? - Completed
3. What's missing from the data and how do you deal with it? - Completed
4. Where are the outliers and why should you care about them? - Completed
5. How can you add, change or remove features to get more out of your data? - Pursuing.

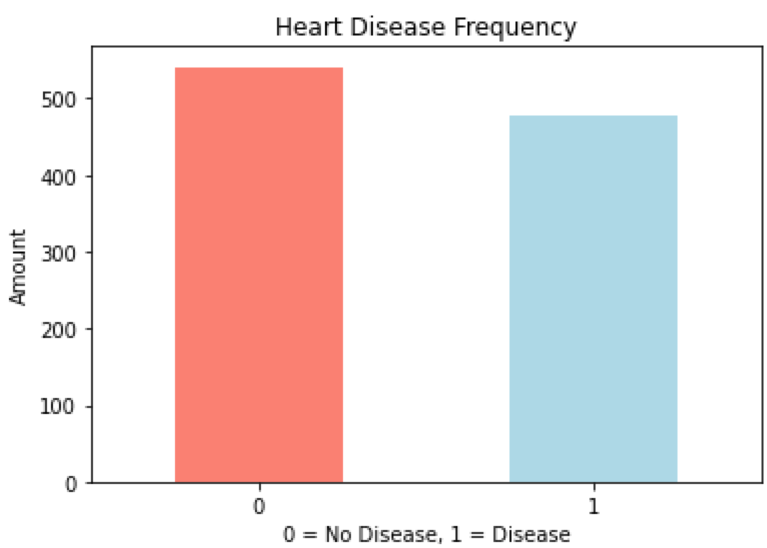
```
# The data looks ot be in good shape after stage loading.
df.head()
```

	Unnamed: 0	age	sex	chest_pain_type	resting_bp_s	cholesterol	fasting_blood_sugar
0	1	40	1	2	140	289	0
1	2	49	0	3	160	180	0

```
# determing how much class
df["target"].value_counts()
```

```
0    541
1    477
Name: target, dtype: int64
```

```
df["target"].value_counts().plot(kind = "bar", color =["salmon","lightblue"]);
plt.title("Heart Disease Frequency")
plt.xlabel("0 = No Disease, 1 = Disease")
plt.ylabel("Amount")
plt.xticks(rotation = 0);

# The total number of person with heart diseasse is just under those without.  We can look aa
```



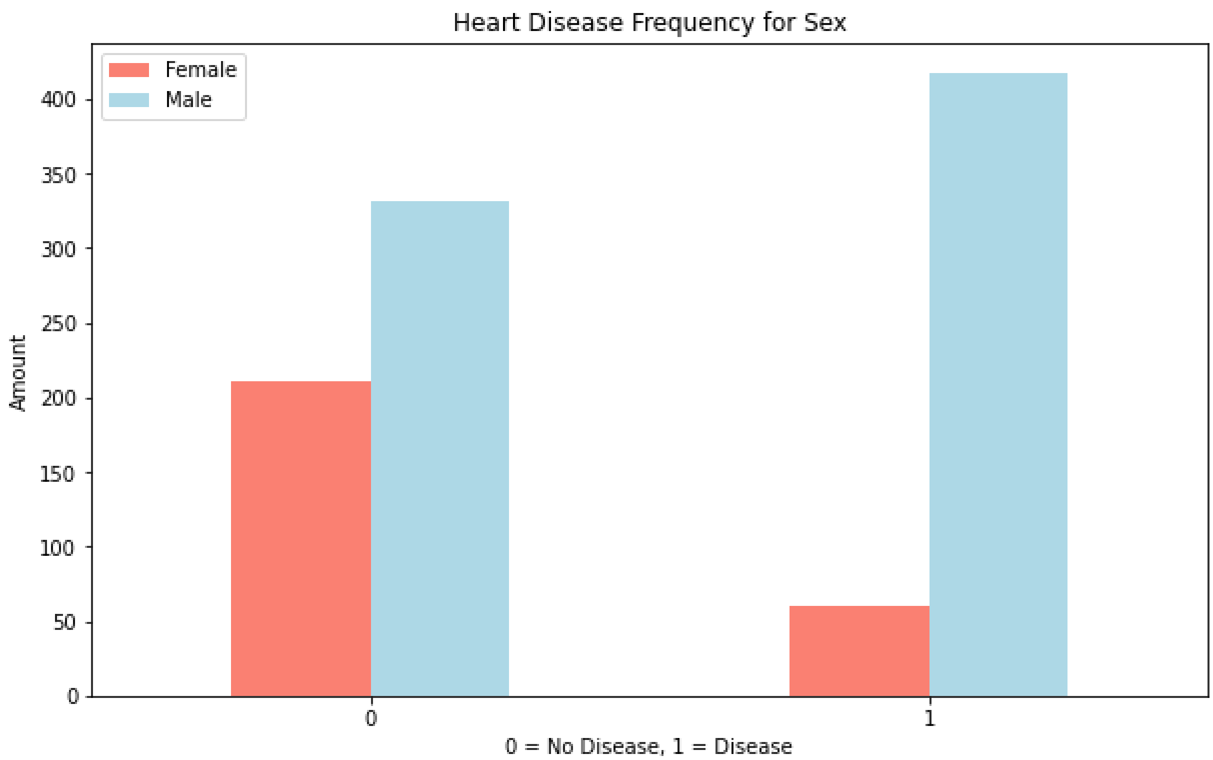

```
## Heart Disease according to sex
df.sex.value_counts()
```

```
1    748
0    270
Name: sex, dtype: int64
```

```
# compare target column with sex coloumn
pd.crosstab(df.target, df.sex)
# The data set contains more male participants.
```

sex	0	1
target		
0	210	331

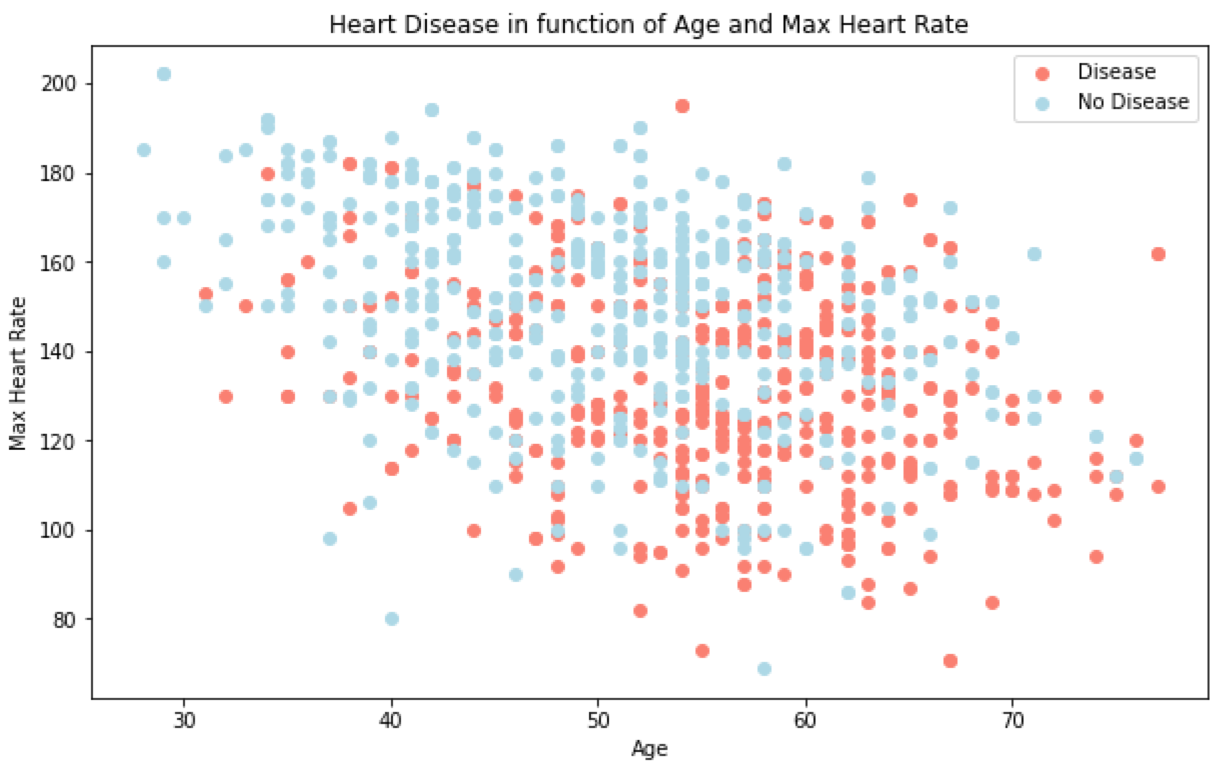
```
# create a plot of crosstab
pd.crosstab(df.target, df.sex).plot(kind = "bar", color = ["salmon", "lightblue"], figsize =

plt.title("Heart Disease Frequency for Sex")
plt.xlabel("0 = No Disease, 1 = Disease")
plt.ylabel("Amount")
plt.legend(["Female", "Male"])
plt.xticks(rotation = 0);
```



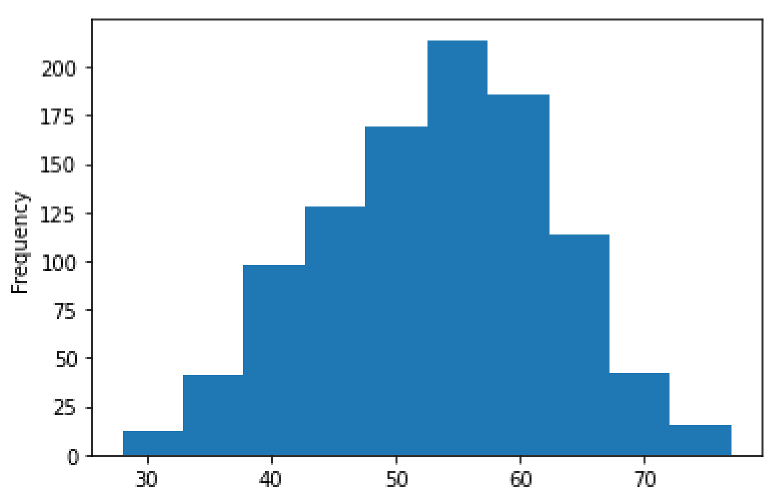
Age vs. max Heart Rate for Disease

```
# Create another figure
plt.figure(figsize = (10, 6))

# Scatter with positive examples
plt.scatter(df.age[df.target == 1],
            df.max_heart_rate[df.target == 1],
            c = "salmon")

# Scatter with negative examples
```

```
plt.scatter(df.age[df.target == 0],
            df.max_heart_rate[df.target == 0],
            c = "lightblue")

# Add some helpfull info
plt.title("Heart Disease in function of Age and Max Heart Rate")
plt.xlabel("Age")
plt.ylabel("Max Heart Rate")
plt.legend(["Disease", "No Disease"]);
# infering from the plot we can see most of the data point is between 38 to 68
# Also tthe younger a person is the higher thier heart rate is and converse to that the older
# Heart disease participants is densely populated on the right hand side.
```




```
# Checking distribution of age colunm with a Histogram
df.age.plot.hist();
```



```
from scipy.stats.mstats_basic import skew
# We can calculate skewness
skew(df.age)
```

```
masked_array(data=-0.12426938,
             mask=False,
       fill_value=1e+20)
```

Heart Disease Frequecy per Chest pain Type

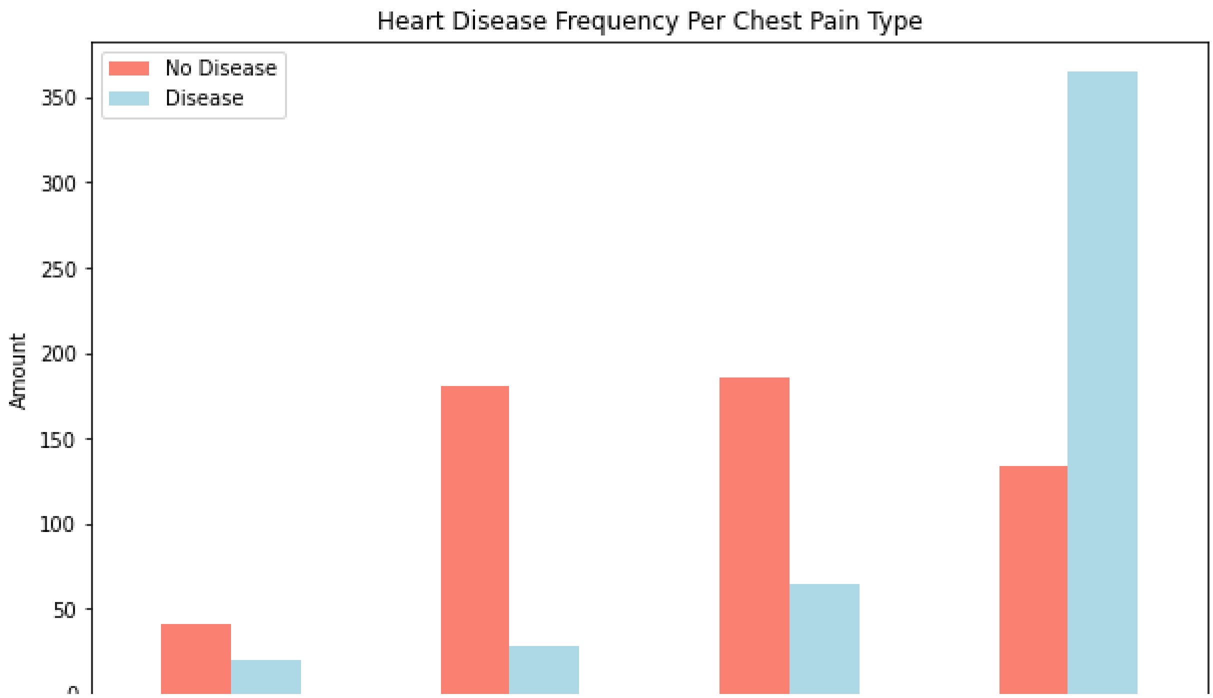
chest pain type:

```
*   1: Typical angina: chest pain related decrease blood supply to the heart;
*   2: Atypical angina: chest pain not related to heart;
*   3: Non-anginal pain: typically esophageal spasms (non heart related);
*   4: Asymptomatic: chest pain not showing signs of disease.
```

```
pd.crosstab(df.chest_pain_type, df.target)
```

target	0	1
chest_pain_type		
1	41	20
2	181	28
3	185	64
4	134	365

```
# Make the crosstab more visible
pd.crosstab(df.chest_pain_type, df.target).plot(kind = "bar", figsize = (10, 6), color = ["sa

# Asymtomatic is very high in value and this chest_pain feature needs tobe further investgate
plt.title("Heart Disease Frequency Per Chest Pain Type")
plt.xlabel("Chest Pain Type")
plt.ylabel("Amount")
plt.legend(["No Disease", "Disease"])
plt.xticks(rotation = 0);
```



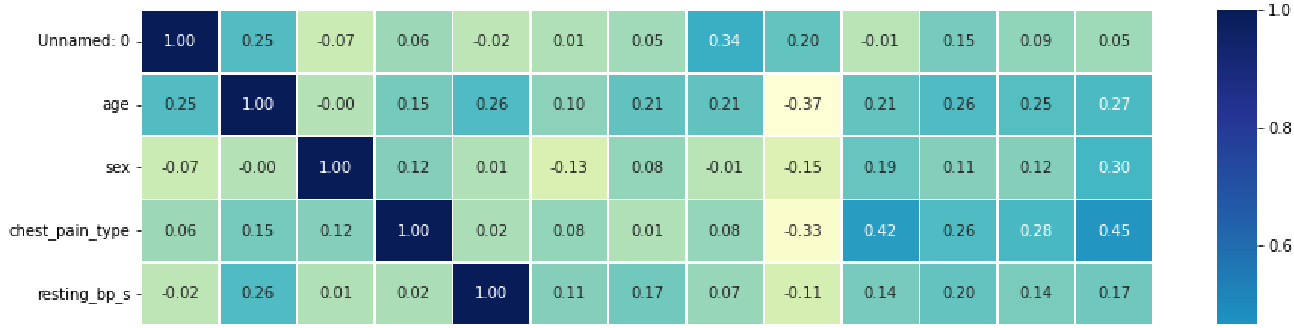

```
# Need to refresh my mind on the data.
df.head()
```

	Unnamed: 0	age	sex	chest_pain_type	resting_bp_s	cholesterol	fasting_blood_sugar
0	1	40	1	2	140	289	0
1	2	49	0	3	160	180	0
2	3	37	1	2	130	283	0
3	4	48	0	4	138	214	0

```
# Make a correlation matrix
df.corr()
```

	Unnamed: 0	age	sex	chest_pain_type	resting_bp_s	choles
Unnamed: 0	1.000000	0.254598	-0.065389	0.059660	-0.024570	0.(
age	0.254598	1.000000	-0.000812	0.154295	0.259836	0.(
sex	-0.065389	-0.000812	1.000000	0.115732	0.012293	-0.1
chest_pain_type	0.059660	0.154295	0.115732	1.000000	0.021156	0.(
resting_bp_s	-0.024570	0.259836	0.012293	0.021156	1.000000	0.1
cholesterol	0.009710	0.098634	-0.132119	0.083201	0.112951	1.(
fasting_blood_sugar	0.048949	0.209705	0.083098	0.007749	0.169577	0.(

```
# Better to plot it in order to better understand the data.
# Slope and chess_pain are amoung the features that has good correlation values

corr_matrix = df.corr()
fig, ax = plt.subplots(figsize = (15, 10))
ax = sns.heatmap(corr_matrix, annot = True, linewidths = 0.5, fmt = ".2f", cmap = "YlGnBu");

# bottom, top = ax.get_ylim()
# ax.set_ylim(bottom + 0.5, top - 0.5)
```



3. Machine Learning Modeling and Prediction(RandomForest model)

- We have 11 independent variables and a dependent(target) variable which is binary.
- Given clinical parameters about a patient, can we predict whether or not they have heart disease?
- Since the target is binary, we can use clasification models for the problem.

```
df.head()
```

	Unnamed: 0	age	sex	chest_pain_type	resting_bp_s	cholesterol	fasting_blood_sugar
0	1	40	1	2	140	289	0
1	2	49	0	3	160	180	0
2	3	37	1	2	130	283	0
3	4	48	0	4	138	214	0

I am going to use all the vairable to predict the target variable.

Hence, I shall split of the target variable from the dataframe.

```
# split x/y
x = df.drop("target", axis = 1)
y = df["target"]
```

```
# Looking at x we can now see target is no longer int he dataframe.
x
```

	Unnamed: 0	age	sex	chest_pain_type	resting_bp_s	cholesterol	fasting_blood_sug
0	1	40	1	2	140	289	
1	2	49	0	3	160	180	
2	3	37	1	2	130	283	
3	4	48	0	4	138	214	
4	5	54	1	3	150	195	
...	...	...	...	...	...	...	
1013	1186	45	1	1	110	264	
1014	1187	68	1	4	144	193	
1015	1188	57	1	4	130	131	
1016	1189	57	0	2	130	236	

```
# Now lut us inspect y.
y
```

```
0       0
1       1
2       0
3       1
4       0
        ..
1013    1
1014    1
1015    1
1016    1
1017    0
Name: target, Length: 1018, dtype: int64
```

```
# split the data into test and train sets.  I will use 20% as test_size since the data is fai

np.random.seed(42)

x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.2)
```

```
x_train
```

	Unnamed: 0	age	sex	chest_pain_type	resting_bp_s	cholesterol	fasting_blood_suga
137	138	39	1	2	120	241	
780	953	60	1	4	145	282	
754	927	61	1	3	150	243	
289	290	48	0	2	133	308	
899	1072	60	0	4	158	305	
...	...	...	...	...	...	...	.
106	107	48	0	4	120	254	
270	271	47	0	3	130	235	

```
# We now have 814 samples to train on
y_train, len(y_train)
```

```
(137    0
 780    1
 754    0
 289    0
 899    1
       ..
 106    0
 270    0
 860    1
 435    0
 102    1
 Name: target, Length: 814, dtype: int64, 814)
```

We have now split the data into training and test sets, so it's time to build a machine learning model. We will train the model (find the patterns) on the training set, and then we will test it (use the patterns) on the test set.

I am going to try one of the different machine learning models. Choosing the right estimatar was done by using this map(https://scikit-learn.org/stable/tutorial/machine_learning_map/index.html):

1. Logistic Regression(not going to be used)
2. K-Nearest Neighbours Classifier
3. Random Forest Classifier.

Because our dataset is small, I can experiment to see which algorithm performs the best. However, I shall Random Forest and KNN. Both models can use the below mention procedures.

For training a model, model.fit(X_train, y_train), and scoring a model, model.score(X_train, y_train), all of the algorithms in the Scikit-Learn library use the same functions.

(x_test, y_test) score score() returns the percentage of correct predictions (1.0 = 100% correct).

Because the algorithms we've chosen use the same methods for fitting and evaluating them, let's put them in a dictionary and create a which fits and scores them.

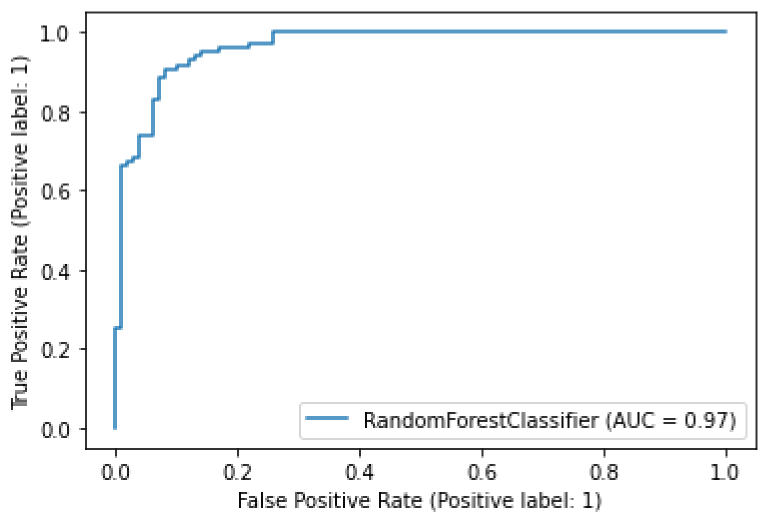
```
model = RandomForestClassifier(n_estimators=900)
model.fit(x_train, y_train)
y_pred = model.predict(x_test)
```

Evaluation of our classification models beyond "Accuracy." We want:

- ROC curve and AUC score - plot_roc_curve()
- Confusion matrix - confusion_matrix()
- Classification report - classification_report()
- Precision - precision_score()
- Recall - recall_score()
- F1-score - f1_score()

```
# Plot ROC curve and calculate AUC metric
plot_roc_curve(model, x_test, y_test);
```

```
/usr/local/lib/python3.7/dist-packages/sklearn/utils/deprecation.py:87: FutureWarning: F
  warnings.warn(msg, category=FutureWarning)
```

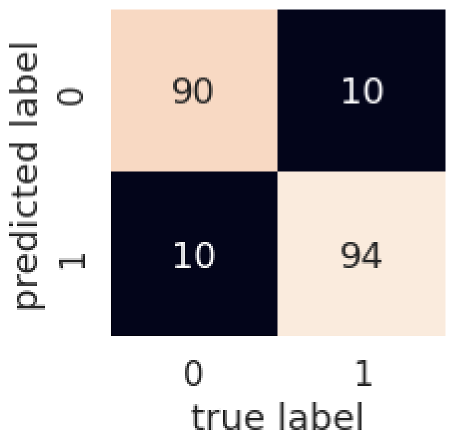



```
# Display confusion matrix
print(confusion_matrix(y_test, y_pred))
```

```
[[90 10]
 [10 94]]
```

```
# Seaborn already imported above
sns.set(font_scale=1.5) # Increase font size
```

```
def plot_conf_mat(y_test, y_pred):
    """
    Plots a confusion matrix using Seaborn's heatmap().
    """
    fig, ax = plt.subplots(figsize=(3, 3))
    ax = sns.heatmap(confusion_matrix(y_test, y_pred),
                     annot=True, # Annotate the boxes
                     cbar=False)
    plt.xlabel("true label")
    plt.ylabel("predicted label")

plot_conf_mat(y_test, y_pred)

# There are 10 cases when the model should have predict zero when it shold have been one.
# There are 10 case when the model shoudl have predicted one when it shoud have predict zero.
```




```
print(classification_report(y_test,y_pred))
```

```
              precision    recall  f1-score   support

           0       0.90      0.90      0.90       100
           1       0.90      0.90      0.90       104

    accuracy                           0.90       204
   macro avg       0.90      0.90      0.90       204
weighted avg       0.90      0.90      0.90       204
```

- Precision - Thus score is too bad. If the model falsely predict someone had heart disease further test can be done to varify.
- Recall - Seeing that this model is to be used to detect heart disease. For every 10 person that is predict to have no heart disease one will be incorrect. Ideally i would have like this recall score around 0.95 for this use.
- F1 score - A perfect model achieves an F1 score of 1.0. and our model

- Support - The number of samples each metric was calculated on.
- Accuracy - The accuracy of the model in decimal form. Perfect accuracy is equal to 1.0. and this model gives us 0.80. Needs improvement.
- Macro avg - This model does not take class imbalace into account. Since we have clas imbalance I would not think to much about the score.
- Weighted avg - This method favors the majority class which in this case is zero.

4. Deep learning Modeling and Prediction(KNN model)

1. Data structure visualization.
2. Viariable transformation.
3. Training data and testing data split.

```
# Getting my data
data = pd.read_csv("/content/drive/MyDrive/Integrated assesment/Clean_heart_data.csv")
df.shape #rows and columns
```

```
(1018, 13)
```

```
data_le = np.zeros_like(data)                    # Set up a matrix for encoded data
data_le[:,0] = data.iloc[:,0]                    # The first coloum requires no encoding
for i in range(1, data.shape[1]):                # Encode the data using label encoder
   le = LabelEncoder().fit(data.iloc[:,i])
   data_le[:,i] = le.transform(data.iloc[:,i])
```

```
print (data_le)
```

```
[[1.000e+00 1.200e+01 1.000e+00 ... 1.000e+00 1.000e+00 0.000e+00]
 [2.000e+00 2.100e+01 0.000e+00 ... 1.100e+01 2.000e+00 1.000e+00]
 [3.000e+00 9.000e+00 1.000e+00 ... 1.000e+00 1.000e+00 0.000e+00]
 ...
 [1.188e+03 2.900e+01 1.000e+00 ... 1.300e+01 2.000e+00 1.000e+00]
 [1.189e+03 2.900e+01 0.000e+00 ... 1.000e+00 2.000e+00 1.000e+00]
 [1.190e+03 1.000e+01 1.000e+00 ... 1.000e+00 1.000e+00 0.000e+00]]
```

```
input = data_le[:,:-1]     # Features
labels = data_le[:,-1:]    # labels

print ('Shape of features:', input.shape)
print ('Shape of labels:', labels.shape)
```

```
Shape of features: (1018, 12)
Shape of labels: (1018, 1)
```

```
onehot = OneHotEncoder()                              #An objective for one-hot package
labels_onehot = onehot.fit_transform(labels).toarray() #Transform labels to be the one-hot fo
print (labels_onehot)
```

```
[[1. 0.]
 [0. 1.]
 [1. 0.]
 ...
 [0. 1.]
 [0. 1.]
 [1. 0.]]
```

KNN Model Training

```
classifier = KNN(n_neighbors=3, p = 2).fit(x_train, y_train)         # Model fitting using th
print ('training accuracy:', classifier.score(x_train, y_train))
```

```
training accuracy: 0.8022113022113022
```

KNN Model Testing and Evaluation

```
prediction = classifier.predict(x_test)                       # Predict the testing set
print (accuracy_score(prediction, y_test))                    # Evaluate the accuracy in the
```

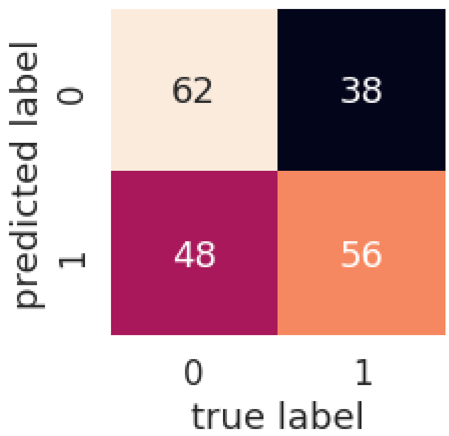
```
0.5784313725490197
```

```
print(confusion_matrix(y_test,prediction))
```

```
[[62 38]
 [48 56]]
```

```
sns.set(font_scale=1.5) # Increase font size

def plot_conf_mat(y_test, y_pred):
    """
    Plots a confusion matrix using Seaborn's heatmap().
    """
    fig, ax = plt.subplots(figsize=(3, 3))
    ax = sns.heatmap(confusion_matrix(y_test, prediction),
                     annot=True, # Annotate the boxes
                     cbar=False)
    plt.xlabel("true label")
    plt.ylabel("predicted label")

plot_conf_mat(y_test, prediction)
```

```
# There are 38 cases when the model should have predict zero when it shold have been one.
# There are 48 case when the model shoudl have predicted one when it shoud have predict zero.
```




```
print(classification_report(y_test,prediction))
```

```
              precision    recall  f1-score   support

           0       0.56      0.62      0.59       100
           1       0.60      0.54      0.57       104

    accuracy                           0.58       204
   macro avg       0.58      0.58      0.58       204
weighted avg       0.58      0.58      0.58       204
```

RandomForest out perform this model in every one of the evaluation metrics. Granted KNN performs poorly with outliers and an imbalance dataset, but, I removed the outliers and the imbalance is very small.

Nearal Network

Create Training and Testing Datasets

Now that we have preprocessed the data appropriately, we can split it into training and testings datasets. We will use Sklearn's train_test_split() function to generate a training dataset (80 percent of the total data) and testing dataset (20 percent of the total data).

Building and Training the Neural Network¶

Now that we have our data fully processed and split into training and testing datasets, we can begin building a neural network to solve this classification problem. Using keras, we will define a simple neural network with one hidden layer. Since this is a categorical classification problem, we will use a softmax activation function in the final layer of our network and a categorical_crossentropy loss during our training phase.

Importing tools.

```
# Importing the Keras libraries and packages
import keras

from keras.models import Sequential
from keras.layers import Dense
from keras.layers import LeakyReLU,PReLU,ELU
from keras.layers import Dropout
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
```

Split data into x/y

```
X = df.iloc[:,0:-1].values
y = df.iloc[:,-1].values
```

Split into Test/Train

```
# Split data in Train set and Test set
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.3)
```

```
#  Feature scaling
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
```

```
# Initialising the ANN
classifier = Sequential()

# Adding the input layer and the first hidden layer
classifier.add(Dense(units = 12, kernel_initializer = 'he_uniform',activation='relu',input_di

# Adding the second hidden layer
classifier.add(Dense(units = 12, kernel_initializer = 'he_uniform',activation='relu'))
```

```
# Adding the thrid hidden layer
classifier.add(Dense(units = 12, kernel_initializer = 'he_uniform',activation='relu'))

# Adding the output layer
classifier.add(Dense(units = 1, kernel_initializer = 'glorot_uniform', activation = 'sigmoid'

# Compiling the ANN
classifier.compile(optimizer = 'Adamax', loss = 'binary_crossentropy', metrics = ['accuracy']

# Fitting the ANN to the Train set
model_history = classifier.fit(X_train,y_train,validation_split=0.33, batch_size=12,epochs=10
```

```
Epoch 1/100
40/40 [==============================] - 0s 5ms/step - loss: 0.2607 - accuracy: 0.897
Epoch 2/100
40/40 [==============================] - 0s 5ms/step - loss: 0.2595 - accuracy: 0.895
Epoch 3/100
40/40 [==============================] - 0s 5ms/step - loss: 0.2592 - accuracy: 0.899
Epoch 4/100
40/40 [==============================] - 0s 5ms/step - loss: 0.2582 - accuracy: 0.897
Epoch 5/100
40/40 [==============================] - 0s 5ms/step - loss: 0.2564 - accuracy: 0.899
Epoch 6/100
40/40 [==============================] - 0s 5ms/step - loss: 0.2556 - accuracy: 0.901
Epoch 7/100
40/40 [==============================] - 0s 5ms/step - loss: 0.2546 - accuracy: 0.901
Epoch 8/100
40/40 [==============================] - 0s 6ms/step - loss: 0.2535 - accuracy: 0.899
Epoch 9/100
40/40 [==============================] - 0s 5ms/step - loss: 0.2526 - accuracy: 0.899
Epoch 10/100
40/40 [==============================] - 0s 5ms/step - loss: 0.2519 - accuracy: 0.901
Epoch 11/100
40/40 [==============================] - 0s 5ms/step - loss: 0.2507 - accuracy: 0.901
Epoch 12/100
40/40 [==============================] - 0s 5ms/step - loss: 0.2498 - accuracy: 0.901
Epoch 13/100
40/40 [==============================] - 0s 6ms/step - loss: 0.2494 - accuracy: 0.899
Epoch 14/100
40/40 [==============================] - 0s 7ms/step - loss: 0.2483 - accuracy: 0.901
Epoch 15/100
40/40 [==============================] - 0s 5ms/step - loss: 0.2476 - accuracy: 0.901
Epoch 16/100
40/40 [==============================] - 0s 3ms/step - loss: 0.2469 - accuracy: 0.901
Epoch 17/100
40/40 [==============================] - 0s 4ms/step - loss: 0.2460 - accuracy: 0.901
Epoch 18/100
40/40 [==============================] - 0s 4ms/step - loss: 0.2452 - accuracy: 0.901
Epoch 19/100
40/40 [==============================] - 0s 3ms/step - loss: 0.2445 - accuracy: 0.903
Epoch 20/100
40/40 [==============================] - 0s 2ms/step - loss: 0.2431 - accuracy: 0.903
Epoch 21/100
40/40 [==============================] - 0s 3ms/step - loss: 0.2425 - accuracy: 0.901
```

```
Epoch 22/100
40/40 [==============================] - 0s 3ms/step - loss: 0.2417 - accuracy: 0.901
Epoch 23/100
40/40 [==============================] - 0s 2ms/step - loss: 0.2407 - accuracy: 0.903
Epoch 24/100
40/40 [==============================] - 0s 4ms/step - loss: 0.2396 - accuracy: 0.903
Epoch 25/100
40/40 [==============================] - 0s 2ms/step - loss: 0.2389 - accuracy: 0.903
Epoch 26/100
40/40 [==============================] - 0s 2ms/step - loss: 0.2387 - accuracy: 0.905
Epoch 27/100
40/40 [==============================] - 0s 2ms/step - loss: 0.2374 - accuracy: 0.903
Epoch 28/100
40/40 [==============================] - 0s 4ms/step - loss: 0.2366 - accuracy: 0.903
Epoch 29/100
```

```
# Predicting the Test set results
y_pred = classifier.predict(X_test)
y_pred = (y_pred > 0.5)


for i in range(len(y_pred)):
    print("Predicted %d------> Expected %d" %(y_pred[[i]],y_test[i]))
```

```
Predicted 0------> Expected 0
Predicted 0------> Expected 0
Predicted 0------> Expected 1
Predicted 0------> Expected 0
Predicted 1------> Expected 1
Predicted 0------> Expected 0
Predicted 0------> Expected 0
Predicted 0------> Expected 0
Predicted 1------> Expected 1
Predicted 0------> Expected 0
Predicted 0------> Expected 0
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Predicted 1------> Expected 1
Predicted 0------> Expected 0
Predicted 1------> Expected 1
Predicted 0------> Expected 0
Predicted 1------> Expected 1
```

```
Predicted 0------> Expected 0
Predicted 1------> Expected 1
Predicted 0------> Expected 0
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Predicted 1------> Expected 1
Predicted 0------> Expected 0
Predicted 0------> Expected 0
Predicted 1------> Expected 1
Predicted 0------> Expected 0
Predicted 1------> Expected 1
Predicted 1------> Expected 1
Predicted 1------> Expected 1
Predicted 1------> Expected 1
```

```
# Making the Confusion Matrix
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test, y_pred)
cm
```

```
array([[142,  21],
       [ 24, 119]])
```

```
# Calculate the Accuracy
from sklearn.metrics import accuracy_score
score=accuracy_score(y_pred,y_test)
score
```

```
0.8529411764705882
```

```
print(classification_report(y_pred, y_test))
```

```
              precision    recall  f1-score   support

       False       0.87      0.86      0.86       166
        True       0.83      0.85      0.84       140

    accuracy                           0.85       306
   macro avg       0.85      0.85      0.85       306
```

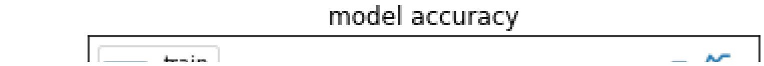
```
    weighted avg       0.85      0.85      0.85       306
```

```
# list all data in history

print(model_history.history.keys())
# summarize history for accuracy
plt.plot(model_history.history['accuracy'])
plt.plot(model_history.history['val_accuracy'])
plt.title('model accuracy')
plt.ylabel('accuracy')
plt.xlabel('epoch')
plt.legend(['train', 'test'], loc='upper left')
plt.show()

# summarize history for loss
plt.plot(model_history.history['loss'])
plt.plot(model_history.history['val_loss'])
plt.title('model loss')
plt.ylabel('loss')
plt.xlabel('epoch')
plt.legend(['train', 'test'], loc='upper left')
plt.show()
```

```
dict_keys(['loss', 'accuracy', 'val_loss', 'val_accuracy'])
```



There are 21 cases when the model should have predict zero when it shold have been one.

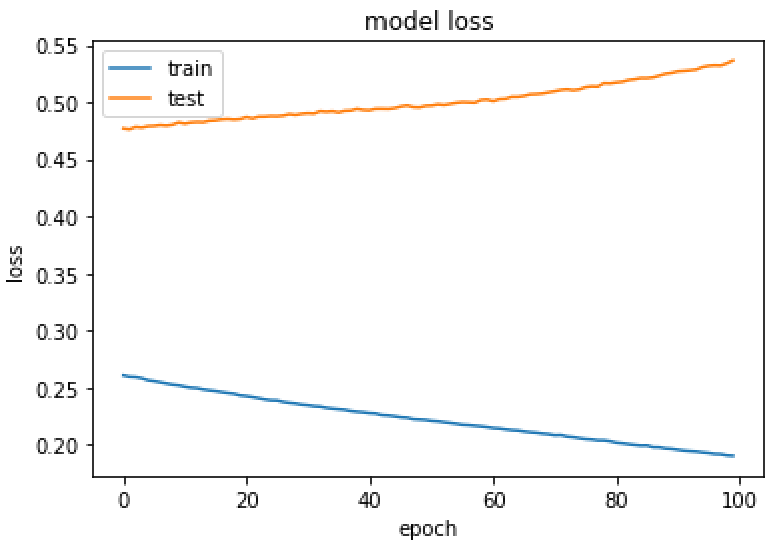
There are 24 case when the model shoudl have predicted one when it shoud have predict zero.

Data Management Plan ad Author Contribution

This plan is in the appendix in the report. Authors:

Mr. Sookchand Harripersad.

epoch



Heart Disease Dataset Attribute Description

S.No.	Attribute	Code given	Unit	Data type
1	age	Age	in years	Numeric
2	sex	Sex	1, 0	Binary
3	chest pain type	chest pain type	1,2,3,4	Nominal
4	resting blood pressure	resting bp s	in mm Hg	Numeric
5	serum cholesterol	cholesterol	in mg/dl	Numeric
6	fasting blood sugar	fasting blood sugar	1,0 > 120 mg/dl	Binary
7	resting electrocardiogram results	resting ecg	0,1,2	Nominal
8	maximum heart rate achieved	max heart rate	71–202	Numeric
9	exercise induced angina	exercise angina	0,1	Binary
10	oldpeak =ST	oldpeak	depression	Numeric
11	the slope of the peak exercise ST segment	ST slope	0,1,2	Nominal
12	class	target	0,1	Binary

Description of Nominal Attributes

Attribute	Description
Sex	1 = male, 0= female;
Chest Pain Type	-- Value 1: typical angina -- Value 2: atypical angina -- Value 3: non-anginal pain -- Value 4: asymptomatic
Fasting Blood sugar	(fasting blood sugar > 120 mg/dl) (1 = true; 0 = false)
Resting electrocardiogram results	-- Value 0: normal -- Value 1: having ST-T wave abnormality (T wave inversions and/or ST elevation or depression of > 0.05 mV) -- Value 2: showing probable or definite left ventricular hypertrophy by Estes' criteria
Exercise induced angina	1 = yes; 0 = no
the slope of the peak exercise ST segment	-- Value 1: upsloping -- Value 2: flat -- Value 3: downsloping
class	1 = heart disease, 0 = Normal

Re: Predictive Data Analysis Group 4

Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Fri 11/03/2022 11:36
To: Stasha Lauria (Staff) <Stasha.Lauria@brunel.ac.uk>

Dear Stasha

Thank you for your support!

Have a great weekend.

Kind regards
Sookchand Harripersad

From: Stasha Lauria (Staff) <Stasha.Lauria@brunel.ac.uk>
Sent: 11 March 2022 08:11
To: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Subject: Re: Predictive Data Analysis Group 4

Dear Sookchand,

Thanks for the update. Yes you are having the correct approach. Looking forward to seeing your work.

Regards,
Stasha

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Sent: 10 March 2022 14:53
To: Stasha Lauria (Staff) <Stasha.Lauria@brunel.ac.uk>
Subject: Re: Predictive Data Analysis Group 4

Dear Stasha,

I am yet to receive any communication from PDA group 4. I have moved on to my individual part of the project and you can see there has been no attempt of anyone to communicate regarding this project.

Thank you,

kind regards

Sookchand Harripersad

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Sent: 28 February 2022 13:47
To: Stasha Lauria (Staff) <Stasha.Lauria@brunel.ac.uk>
Cc: William Marshall (Student) <1839575@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>;

Rehab Musse (Student) <1807434@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>
Subject: Fw: Predictive Data Analysis Group 4

Dear Stasha,

I know that group participation is an important part of the marking scheme. However, as you can see from the email thread, no one has participated. As a result, I took the lead and decided to complete the below-mentioned tasks were done by me including the splitting of the data into train/test, and shared it with everyone in the group:

1. Data Description and Research Question.
2. Data Preparation and Clean
3. Exploratory Data Analysis

I am now moving on to the project's individual aspect, and I have chosen to use the Random Forest.

Thank you,

Kind regards

Sookchand Harripersad

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Sent: 28 February 2022 09:44
To: William Marshall (Student) <1839575@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>; Stasha Lauria (Staff) <Stasha.Lauria@brunel.ac.uk>
Subject: Re: Predictive Data Analysis Group 4

Hello All,

As per your request Zeerak, I am attaching an updated RStudio file, Google Colab file, and both the cleaned and uncleaned dataset.

I shall be using RandomForest as my choice of model for this project.

Let me know when you have completed your model so that we can compare the results

Thank you,
Kind Regards

Sookchand

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Sent: 27 February 2022 13:34
To: William Marshall (Student) <1839575@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>; Stasha

Lauria (Staff) <Stasha.Lauria@brunel.ac.uk>
Subject: Predictive Data Analysis Group 4

Dear All,

I have completed:

1. Data Description and Research Question
2. Data Preparation and Clean(done on RStudio)
3. Evaluation - Some done in RStudio and the rest will be done on this notebook.

I am no moving on to the individual aspect of this project. If anyone is interested, I can send the first 3 parts.

Thank you,

Kind regards
Sookchand Harripersad

From: William Marshall (Student) <1839575@brunel.ac.uk>
Sent: 25 January 2022 10:51
To: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>
Subject: Re: group introduction

Sounds like a start. Do you think we should plan a meeting? We can present some datasets and decide which to pick.
From William.

Get [Outlook for Android]

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Sent: Tuesday, January 25, 2022 10:48:59 AM
To: William Marshall (Student) <1839575@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>
Subject: Re: group introduction

Good Morning Guys,

I trust that you are all well. Shall we begin our first task by identifying a dataset?

Thank you,

Kind Regards
Sookchand.

From: William Marshall (Student) <1839575@brunel.ac.uk>
Sent: 12 January 2022 11:12
To: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>
Subject: Re: group introduction

Here is the WhatsApp link:
https://chat.whatsapp.com/HfQYmOniFo43MkIrPitWY3

Get Outlook for Android

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Sent: Wednesday, January 12, 2022 10:56:03 AM
To: William Marshall (Student) <1839575@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>
Subject: Re: group introduction

Good morning, everyone,

this is my number for the WhatsApp group: +44 7591 083032.

Have a good day,

Sookchand

From: William Marshall (Student) <1839575@brunel.ac.uk>
Sent: 11 January 2022 14:59
To: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>
Subject: Re: group introduction

Hi,
I also have similar circumstances so I think it would be best to stick to online for now. For ease of communication we could set up a WhatsApp or discord.
William

Get Outlook for Android

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Sent: Tuesday, January 11, 2022 2:53:16 PM
To: Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>; William Marshall (Student) <1839575@brunel.ac.uk>
Subject: group introduction

Hello everyone,

Based upon the group information on BBL I see that we are all in group 4. So, I am taking the initiative to reach out to you all so that we begin thinking about our way forward. For now, I cannot meet in person so I would appreciate it if you could keep this in mind as we move forward.

Have a great day.

Kind regards
Sookchand

Fw: Predictive Data Analysis Group 4

Sookchand Harripersad (Student) <2121403@brunel.ac.uk>

Sat 23/04/2022 20:39

To: Stasha Lauria (Staff) <Stasha.Lauria@brunel.ac.uk>

Cc: Zeerak Jawed (Student) <1723254@brunel.ac.uk>;Rehab Musse (Student) <1807434@brunel.ac.uk>;Sandilya Bojja (Student) <1735848@brunel.ac.uk>;William Marshall (Student) <1839575@brunel.ac.uk>

Dear Stasha,

At this moment William Marshal is the only group member that shared his model and results. Complete data analysis was sent to all group members on the 28th of February and 11th of April I shared my model and results. At this late hour, I must move with the rest of the project using Marshall's submission for the discussion. Please take note of this.

Thank you,
Kind regards

Sookchand Harripersad

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Sent: 23 April 2022 11:10
To: William Marshall (Student) <1839575@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>; Stasha Lauria (Staff) <Stasha.Lauria@brunel.ac.uk>
Subject: Re: Predictive Data Analysis Group 4

Reminder to the group members except William Marshal to send the models and performance evaluation for comparison(integrated assesment).

Thank you,
regards
Sookchand

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Sent: 22 April 2022 11:27
To: William Marshall (Student) <1839575@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>; Stasha Lauria (Staff) <Stasha.Lauria@brunel.ac.uk>
Subject: Re: Predictive Data Analysis Group 4

Good day all,

I hope you all are doing well. Except for Williams who has already done this, can you all please share your model and results so that I can make the comparison and complete my report.

Thank you,

Regards
Sookchand Harripersad

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Sent: 22 April 2022 06:29
To: William Marshall (Student) <1839575@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>; Stasha Lauria (Staff) <Stasha.Lauria@brunel.ac.uk>
Subject: Fw: Predictive Data Analysis Group 4

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To: Stasha Lauria (Staff) <Stasha.Lauria@brunel.ac.uk>
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Kind regards

Sookchand Harripersad

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
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As per your request Zeerak, I am attaching an updated RStudio file, Google Colab file, and both the cleaned and uncleaned dataset.

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From: William Marshall (Student) <1839575@brunel.ac.uk>
Sent: 12 January 2022 11:12
To: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>
Subject: Re: group introduction

Here is the WhatsApp link:
https://chat.whatsapp.com/HfQYmOniFo43MkIrPitWY3

Get Outlook for Android

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Sent: Wednesday, January 12, 2022 10:56:03 AM
To: William Marshall (Student) <1839575@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>
Subject: Re: group introduction

Good morning, everyone,

this is my number for the WhatsApp group: +44 7591 083032.

Have a good day,

Sookchand

From: William Marshall (Student) <1839575@brunel.ac.uk>
Sent: 11 January 2022 14:59
To: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>; Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>
Subject: Re: group introduction

Hi,

I also have similar circumstances so I think it would be best to stick to online for now. For ease of communication we could set up a WhatsApp or discord.
William

Get [Outlook for Android]

From: Sookchand Harripersad (Student) <2121403@brunel.ac.uk>
Sent: Tuesday, January 11, 2022 2:53:16 PM
To: Zeerak Jawed (Student) <1723254@brunel.ac.uk>; Sandilya Bojja (Student) <1735848@brunel.ac.uk>; Rehab Musse (Student) <1807434@brunel.ac.uk>; William Marshall (Student) <1839575@brunel.ac.uk>
Subject: group introduction

Hello everyone,

Based upon the group information on BBL I see that we are all in group 4. So, I am taking the initiative to reach out to you all so that we begin thinking about our way forward. For now, I cannot meet in person so I would appreciate it if you could keep this in mind as we move forward.

Have a great day.

Kind regards
Sookchand