

Assignment1

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The purpose of this assignment is to get you working with the `recipes` package and preprocessing the variables in two different datasets. You will use the same datasets with processed variables to build models in the next assignments.

There are alternative ways to submit your assignment depending on your preference.

1. You can Copy/Edit this notebook and complete it with your responses. Then, you can save and run the completed Kaggle notebook and submit the link through Canvas. If you keep your notebook Private, do not forget to share it with 'UOCOEEDS' so I can access it.
2. You copy/paste the questions and download the datasets from the notebook to your computer. Then, complete the assignment as an R markdown document. Then, you can knit the R Markdown document to a PDF and submit both the .Rmd and PDF files by uploading them on Canvas.
3. You knit the R Markdown document to an HTML document and host it on your website/blog or any publicly available platform. Then, you can submit the .Rmd file by uploading it on Canvas and putting the link for the HTML document as a comment.
4. If you have a GitHub repo and store all your work for this class in a GitHub repo, you can create a folder for this assignment in that repo and put the.Rmd file and PDF document under a specific folder. Then, you can submit the link for the GitHub repo on Canvas.

To receive full credit, you must complete the following tasks. Please make sure that all the R code you wrote for completing these tasks and any associated output are explicitly printed in your submitted document. If the task asks you to submit the data files you created, please upload these datasets along with your submission.

If you have any questions, please do not hesitate to reach out to me.

Task 1: Preprocessing Text Data

Description

For this part of the assignment, you will work with a Twitter dataset which is randomly sampled from a larger dataset on the Kaggle platform (see this link for the original data). In this subset data, there are 1,500 tweets and three variables. A description of the three variables in the dataset follows:

- **sentiment**: a character string variable with two values (Positive and Negative) for the outcome variable to predict.
- **time**: a character string variable indicating time of a tweet (e.g., Thu Jun 18 07:35:01 PDT 2009)
- **tweet**: a character string variable that provides the full text of a tweet.

This subset data is available as an input data in this R notebook (`../input/tweets/tweet_sub.csv`).

Our ultimate goal is to build a model to predict whether or not a tweet has a positive sentiment by using the information from time of the tweet and text of the tweet. We will do this in the following assignments. For this assignment, we will only engineer features to use them later for building our models and prepare the dataset for model development.

Please complete the following tasks. Provide the R code you wrote and any associated output for each task.

Tasks

Task 1.1 Import the tweet data into the R environment. You can give any name to this data object. Print the structure of this data object using the `str` function.

Task 1.1 Import the tweet data into the R environment. You can give any name to this data object. Print the structure of this data object using the `str` function.

```
library(rio)
```

```
## Warning: package 'rio' was built under R version 4.4.1
```

```
library(here)
```

```
## here() starts at /Users/tianwalker/Documents/Everything/PhD_harddrive/EDLD_654
```

```
library(recipes)
```

```
## Loading required package: dplyr
```

```
##
```

```
## 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
```

```
##
```

```
## Attaching package: 'recipes'
```

```
## The following object is masked from 'package:stats':
```

```
##
```

```
##      step
```

```
library(stringr) #for working with data and time string
```

```
##
```

```
## Attaching package: 'stringr'
```

```
## The following object is masked from 'package:recipes':
```

```
##
```

```
##      fixed
```

```
library(scales)
```

```
data <- rio::import(here("assignment_1/data/tweet_sub.csv"))
```

```
data2 <- data
```

```
str(data)
```

```
## 'data.frame':   1500 obs. of  3 variables:
```

```
## $ sentiment: chr  "Negative" "Positive" "Positive" "Positive" ...
```

```
## $ time      : chr  "Thu Jun 18 07:35:01 PDT 2009" "Sun May 10 00:31:52 PDT 2009" "Sun May 31 09:15:15 PDT 2009" ...
```

```
## $ tweet     : chr  "I think my twitter is attackd by a kind of worm" "@ddlovato demi if you can i th
```

Task 1.2 The time variable in this dataset is a character string such as *Thu Jun 18 07:35:01 PDT 2009*. Create four new columns in the dataset using this time variable to show the day, date, month, and hour of a tweet. The table below provides some examples of how these four new columns would look like given time as a character string.

time	day	month	date	hour
Thu Jun 18 07:35:01 PDT 2009	4	Jun	18	7
Sun May 10 00:31:52 PDT 2009	7	May	10	0
Sun May 31 09:15:19 PDT 2009	7	May	31	9
Fri May 22 07:25:52 PDT 2009	5	May	22	7
Sun May 31 02:09:52 PDT 2009	7	May	31	2
Sun Jun 07 09:13:08 PDT 2009	7	Jun	7	9

Make sure that `day` column is a numeric variable from 1 to 7 (Monday = 1, Sunday = 7), `date` column is a numeric variable from 1 to 31, and `hour` column is a numeric variable from 0 to 23, and `month` column is a factor variable.

Calculate and print the frequencies for each new column (`day`, `month`, `date`, and `hour`) you created from the original `time`.

DATES

```
data2 <- data
data2$wkday <- gsub( " .*$", "", data2$time )

data2$month <- word(data2$time, 2)
data2$month <- as.factor(data2$month)

data2$date <- word(data2$time, 3) #daynum
data2$date <- as.numeric(data2$date)

data2$hms <- word(data2$time, 4)
data2$hour <- substr(data2$hms, start = 1, stop = 2)
data2$hour <- as.numeric(data2$hour)
#data2$hms <- lubridate::hms(data2$hms) this does a cool thing where it pulls the numbers and labels the
#data2$hms <- word(data2$hms, 1) this pulls mostly just the hour, but in cases where hour is 0 the above
#data2$hms <- gsub("[^[:digit:]]", "", data2$hms) This separates the letter part of the variable

data2 <- data2 %>%
  mutate(day = case_when(

    wkday == "Mon" ~ 1,
    wkday == "Tue" ~ 2,
    wkday == "Wed" ~ 3,
    wkday == "Thu" ~ 4,
    wkday == "Fri" ~ 5,
    wkday == "Sat" ~ 6,
    wkday == "Sun" ~ 7

  ))

data2$day <- as.numeric(data2$day)

perc_day <- table(data2$day)
```

```

mon <- perc_day[1]
tues <- perc_day[2]
weds <- perc_day[3]
thurs <- perc_day[4]
fri <- perc_day[5]
sat <- perc_day[6]
sun <- perc_day[7]

total <- mon + tues + weds + thurs + fri + sat + sun

```

Frequency of posts on days of the week:

```

p_mon <- mon/total
p_mon <- label_percent()(p_mon)

p_tues <- tues/total
p_tues <- label_percent()(p_tues)

p_weds <- weds/total
p_weds <- label_percent()(p_weds)

p_thurs <- thurs/total
p_thurs <- label_percent()(p_thurs)

p_fri <- fri/total
p_fri <- label_percent()(p_fri)

p_sat <- sat/total
p_sat <- label_percent()(p_sat)

p_sun <- sun/total
p_sun <- label_percent()(p_sun)

percents <- c(p_mon, p_tues, p_weds, p_thurs, p_fri, p_sat, p_sun)
names(percents) <- c("Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday", "Sunday")

percents

```

```

##      Monday   Tuesday Wednesday  Thursday    Friday   Saturday    Sunday
##      "20%"    "10%"      "6%"      "8%"      "15%"    "20%"    "21%"

```

```
library(psych)
```

```

##
## Attaching package: 'psych'
## The following objects are masked from 'package:scales':
##
##      alpha, rescale

```

```
describe(data2$date)
```

```

##      vars      n mean  sd median trimmed  mad min max range skew kurtosis   se
## X1      1 1500 15.05 9.8   16   14.82 13.34   1  31   30 0.11   -1.21 0.25

```

```
perc_data <- table(data2$date)
```

```
data3 <- data2
```

#changing variables from numbers to characters so that the frequencies can be calculated based on each

```
data3$date <- as.character(data3$date)
```

```
data3$hour <- as.character(data3$hour)
```

```
library(gtsummary)
```

```
## Warning: package 'gtsummary' was built under R version 4.4.1
```

```
data3 |>
```

```
select(day, month, date, hour ) |>
```

```
tbl_summary()
```

Task 1.3 Recode the outcome variable (`sentiment`) into a binary variable such that Positive is equal to 1 and Negative is equal to 0. Calculate and print the frequencies for tweets with positive and negative sentiments.

```
data2 <- data2 |>
```

```
mutate(sentiment = ifelse(sentiment == "Positive", 1, 0))
```

Task 1.4 Load the `reticulate` package and Python library `sentence_transformers`. Then, generate tweet embeddings for each tweet in this dataset using the `allenai/longformer-base-4096` model. Tweet embeddings for each tweet should be a vector of numbers with length 768. Append these embeddings to the original data.

```
library(reticulate)
```

```
## Warning: package 'reticulate' was built under R version 4.4.1
```

```
##
```

```
## Attaching package: 'reticulate'
```

```
## The following object is masked from 'package:rio':
```

```
##
```

```
## import
```

```
st <- import('sentence_transformers')
```

```
model.name <- 'allenai/longformer-base-4096'
```

```
longformer <- st$models$Transformer(model.name)
```

```
pooling_model <- st$models$Pooling(longformer$get_word_embedding_dimension())
```

```
LFmodel <- st$SentenceTransformer(modules = list(longformer,pooling_model))
```

```
LFmodel$get_max_seq_length()
```

```
## [1] 4098
```

```
LFmodel$get_sentence_embedding_dimension()
```

```
## [1] 768
```

```
read_embeddings <- LFmodel$encode(data2$tweet,  
                                show_progress_bar = TRUE)
```

Task 1.5 Remove the two columns `time` and `tweet` from the dataset as you do not need them anymore.

```
data2 <- data2 |>
  select(-time, -tweet, -wkday, -hms)
```

create ID variable

```
data2 <- tibble::rowid_to_column(data2, "ID")
```

last data preparation

```
outcome <- c('sentiment')

id      <- c('ID')

categorical <- c('month')

cyclic    <- c(
  'date',
  'hour',
  'day')

embed_number <- paste0('x', 1:768)

# 3) Convert all nominal, ordinal, and binary variables to factors
# Leave the rest as is

for(i in categorical){
  data2[,i] <- as.factor(data2[,i])
}

#Repeat with numeric just to be sure that they are all numbers

# for(i in numeric){
#
#   data2[,i] <- as.numeric(data2[,i])
#
# }

typeof(data2$date)

## [1] "double"

typeof(data2$hour)

## [1] "double"

typeof(data2$day)

## [1] "double"
```

put the two data frames together

```
data4 <- cbind(data2, read.embeddings)
library(janitor)
```

```
##
## Attaching package: 'janitor'
## The following objects are masked from 'package:stats':
##
##      chisq.test, fisher.test
data4 <- clean_names(data4)
```

```
data4 <- data4 |>
  rename( "ID" = "id")
```

Task 1.6 Prepare a recipe using the `recipe()` and `prep()` functions from the `recipes` package for final transformation of the variables in this dataset.

First, make sure you have the most recent developer version of the `recipes` package from Github. If not, install it from Github.

```
#devtools::install_github("tidymodels/recipes")
```

Your recipe should have the following specifications:

- each cyclic variable (`day`, `date`, and `hour`) is recoded into two new variables of sin and cos terms (`?step_harmonic()`).
- `month` variable is recoded into dummy variables using one-hot encoding (`?step_dummy`)
- all numerical embeddings (Dim1 - Dim768) are standardized (`?step_normalize`)

Print the blueprint.

```
# blueprint <- recipe(x = data4,
#                      vars = c(categorical,cyclic,embed_number ,outcome,id),
#                      roles = c(rep('predictor',772),'ID', 'outcome')) |>
#
# step_dummy(all_of(categorical),one_hot=TRUE) |>
#
# step_normalize(x1:x768) |>
#
# step_harmonic((day), cycle_size = 7) |>
# step_harmonic((hours), cycle_size = 24) |>
# step_harmonic((date), cycle_size = 31)

blueprint <- recipe(x = data4,
  vars = c(id, outcome, categorical,cyclic,embed_number ),
  roles = c('ID', 'outcome', rep('predictor',772))) |>

  step_dummy(all_of(categorical),one_hot=TRUE) |>

  step_normalize(x1:x768)

  # step_harmonic((date), cycle_size = 31) |>
  # step_harmonic((hour), cycle_size = 23) |>
  # step_harmonic((day), cycle_size = 7)
```

```
blueprint
```

```
##
```

```
## -- Recipe -----
```

```
##
```

```
## -- Inputs
```

```
## Number of variables by role
```

```
## outcome:      1
```

```
## predictor: 772
```

```
## ID:           1
```

```
##
```

```
## -- Operations
```

```
## * Dummy variables from: all_of(categorical)
```

```
## * Centering and scaling for: x1:x768
```

Task 1.7 Finally, apply this recipe to the whole dataset and obtain the final version of the dataset with transformed variables. The final dataset should have 1500 rows and 778 columns as the following:

- 768 columns for tweet embeddings,
- three columns for dummy variables representing the variable `month`,
- two columns for the sin and cos terms representing the variable `day`,
- two columns for the sin and cos terms representing the variable `date`,
- two columns for the sin and cos terms representing the variable `hour`.

```
prepare <- prep(blueprint,  
                training = data4)
```

```
prepare
```

```
##
```

```
## -- Recipe -----
```

```
##
```

```
## -- Inputs
```

```
## Number of variables by role
```

```
## outcome:      1
```

```
## predictor: 772
```

```
## ID:           1
```

```
##
```

```
## -- Training information
```

```
## Training data contained 1500 data points and no incomplete rows.
```

```
##
```

```
## -- Operations
```

```
## * Dummy variables from: month | Trained
```



```
## * Centering and scaling for: x1, x2, x3, x4, x5, x6, x7, x8, ... | Trained
baked_data <- bake(prepare, new_data = data4)

baked_data

## # A tibble: 1,500 x 776
##       ID sentiment  date  hour  day      x1      x2      x3      x4      x5
##   <int>      <dbl> <dbl> <dbl> <dbl>   <dbl>   <dbl>   <dbl>   <dbl>   <dbl>
## 1     1          0    18     7     4 -0.509  0.483  0.881  0.578  0.374
## 2     2          1    10     0     7  0.0167 -1.14  -0.585  0.941 -1.84
## 3     3          1    31     9     7 -0.0711 -1.19  -0.144  0.536 -0.504
## 4     4          1    22     7     5 -0.952  1.28   0.659 -0.584  0.590
## 5     5          1    31     2     7 -0.546 -0.622  1.05  -1.47  -0.118
## 6     6          1     7     9     7 -1.16  -1.28  -0.661  1.53   0.149
## 7     7          0    17    16     3  0.561  0.00783 -1.27  -0.785 -1.78
## 8     8          0     1     6     1  1.25  -1.12   0.0905 -0.614  0.0733
## 9     9          1    26    22     2 -0.0983  0.332  -0.718  0.0439  0.940
## 10    10          1    30     0     6 -0.0604  0.115  -0.511  1.57  -0.290
## # i 1,490 more rows
## # i 766 more variables: x6 <dbl>, x7 <dbl>, x8 <dbl>, x9 <dbl>, x10 <dbl>,
## #   x11 <dbl>, x12 <dbl>, x13 <dbl>, x14 <dbl>, x15 <dbl>, x16 <dbl>,
## #   x17 <dbl>, x18 <dbl>, x19 <dbl>, x20 <dbl>, x21 <dbl>, x22 <dbl>,
## #   x23 <dbl>, x24 <dbl>, x25 <dbl>, x26 <dbl>, x27 <dbl>, x28 <dbl>,
## #   x29 <dbl>, x30 <dbl>, x31 <dbl>, x32 <dbl>, x33 <dbl>, x34 <dbl>,
## #   x35 <dbl>, x36 <dbl>, x37 <dbl>, x38 <dbl>, x39 <dbl>, x40 <dbl>, ...
```

Task 1.8 Export the final dataset (1500 x 778) as a .csv file.

```
write.csv(baked_data, "~/Documents/Everything/PhD_harddrive/EDLD_654/final_dataset")
```

Task 2: Preprocessing Continuous and Categorical Variables

Description

For the second part of the assignment, we are going to use a student performance dataset. The data attributes include student grades, demographic, social and school related features, and it was collected by using school reports and questionnaires. The dataset has 649 observations and 31 variables. This data is available as an input data in this R notebook ('./input/student-performance/student.csv').

Below is a table of data dictionary for the variables in this dataset.

Variable	Name	Description
1	school	student's school (binary: 'GP' - Gabriel Pereira or 'MS' - Mousinho da Silveira)
2	sex	student's sex assigned at birth (binary: 'F' - female or 'M' - male)
3	age	student's age (numeric: from 15 to 22)
4	address	student's home address type (binary: 'U' - urban or 'R' - rural)
5	famsize	family size (binary: 'LE3' - less or equal to 3 or 'GT3' - greater than 3)
6	Pstatus	parent's cohabitation status (binary: 'T' - living together or 'A' - apart)
7	Medu	mother's education (numeric: 0 - none, 1 - primary education (4th grade), 2 - 5th to 9th grade, 3 - secondary education, 4 - higher education)
8	Fedu	father's education (numeric: 0 - none, 1 - primary education (4th grade), 2 - 5th to 9th grade, 3 - secondary education, 4 - higher education)
9	Mjob	mother's job (nominal: 'teacher', 'health' care related, civil 'services' (e.g. administrative or police), 'at_home' or 'other')

Variable	Name	Description
10	Fjob	father's job (nominal: 'teacher', 'health' care related, civil 'services' (e.g. administrative or police), 'at_home' or 'other')
11	reason	reason to choose this school (nominal: close to 'home', school 'reputation', 'course' preference or 'other')
12	guardian	student's guardian (nominal: 'mother', 'father' or 'other')
13	traveltime	home to school travel time (numeric: 1 - <15 min, 2 - 15 to 30 min, 3 - 30min to 1 hour, or 4 >1hour)
14	studytime	weekly study time (numeric: 1 - <2 hours, 2 - 2 to 5 hours, 3 - 5 to 10 hours, or 4 - >10 hours)
15	failures	number of past class failures (numeric: n if 1<=n<3, else 4)
16	schoolsup	extra educational support (binary: yes or no)
17	famsup	family educational support (binary: yes or no)
18	paid	extra paid classes within the course subject (Math or Portuguese) (binary: yes or no)
19	activities	extra-curricular activities (binary: yes or no)
20	nursery	attended nursery school (binary: yes or no)
21	higher	wants to take higher education (binary: yes or no)
22	internet	Internet access at home (binary: yes or no)
23	romantic	with a romantic relationship (binary: yes or no)
24	famrel	quality of family relationships (numeric: from 1 - very bad to 5 - excellent)
25	freetime	free time after school (numeric: from 1 - very low to 5 - very high)
26	goout	going out with friends (numeric: from 1 - very low to 5 - very high)
27	Dalc	workday alcohol consumption (numeric: from 1 - very low to 5 - very high)
28	Walc	weekend alcohol consumption (numeric: from 1 - very low to 5 - very high)
29	health	current health status (numeric: from 1 - very bad to 5 - very good)
30	absences	number of school absences (numeric: from 0 to 93)
31	G3	final grade (numeric: from 0 to 20, output target)

Tasks

Task 2.1 Import the student performance data into the R environment. You can give any name to this data object. Print the structure of this data object using the `str` function.

```
dat <- rio::import(here("assignment_1/data/student2.csv"))
```

```
str(dat)
```

```
## 'data.frame':   649 obs. of  32 variables:
## $ student_id: int  1 2 3 4 5 6 7 8 9 10 ...
## $ school    : chr  "GP" "GP" "GP" "GP" ...
## $ sex       : chr  "F" "F" "F" "F" ...
## $ age       : int  18 17 15 15 16 16 16 17 15 15 ...
## $ address   : chr  "U" "U" "U" "U" ...
## $ famsize   : chr  "GT3" "GT3" "LE3" "GT3" ...
## $ Pstatus   : chr  "A" "T" "T" "T" ...
## $ Medu      : int  4 1 1 4 3 4 2 4 3 3 ...
## $ Fedu      : int  4 1 1 2 3 NA 2 4 2 4 ...
## $ Mjob      : chr  "at_home" "at_home" "at_home" "health" ...
## $ Fjob      : chr  "teacher" "other" "other" "services" ...
## $ reason    : chr  "course" "course" "other" "home" ...
## $ guardian  : chr  "mother" "father" "mother" "mother" ...
## $ traveltime: int  2 1 1 1 1 1 1 2 1 1 ...
## $ studytime : int  2 2 2 3 2 2 2 2 2 2 ...
## $ failures  : int  0 0 0 0 0 0 0 0 0 0 ...
```

```
## $ schoolsup : chr "yes" "no" "yes" "no" ...
## $ famsup : chr "no" "yes" "no" "yes" ...
## $ paid : chr "no" "no" "no" "no" ...
## $ activities: chr "no" "no" "no" "yes" ...
## $ nursery : chr "yes" "no" "yes" "yes" ...
## $ higher : chr "yes" "yes" "yes" "yes" ...
## $ internet : chr "no" "yes" "yes" "yes" ...
## $ romantic : chr "no" "no" "no" "yes" ...
## $ famrel : int 4 5 4 3 4 5 4 4 4 5 ...
## $ freetime : int 3 3 NA 2 3 4 4 1 2 5 ...
## $ goout : int 4 3 2 2 2 2 4 4 2 1 ...
## $ Dalc : int 1 1 2 1 1 1 1 1 1 1 ...
## $ Walc : int 1 1 3 1 2 2 1 1 NA 1 ...
## $ health : int 3 3 3 5 5 5 3 NA NA 5 ...
## $ absences : int 4 2 6 0 0 6 0 2 0 0 ...
## $ G3 : int 11 11 12 14 13 13 13 13 17 13 ...
```

Task 2.2 Using the `ff_glimpse()` function from the `finalfit` package, provide a snapshot of missingness in this dataset. This function also returns the number of levels for categorical variables. If there is any variable with large amount of missingness (e.g. more than 75%), remove this variable from the dataset.

```
library(finalfit)
```

```
ff_glimpse(dat)
```

```
## $Continuous
##          label var_type    n missing_n missing_percent  mean    sd  min
## student_id student_id <int> 649         0             0.0 325.0 187.5  1.0
## age          age      <int> 597        52             8.0  16.8   1.2 15.0
## Medu         Medu     <int> 630        19             2.9   2.5   1.1  0.0
## Fedu         Fedu     <int> 630        19             2.9   2.3   1.1  0.0
## traveltime   traveltime <int> 636        13             2.0   1.6   0.8  1.0
## studytime    studytime <int> 623        26             4.0   1.9   0.8  1.0
## failures     failures <int> 630        19             2.9   0.2   0.6  0.0
## famrel       famrel    <int> 643         6             0.9   3.9   0.9  1.0
## freetime     freetime <int> 623        26             4.0   3.2   1.0  1.0
## goout        goout     <int> 630        19             2.9   3.2   1.2  1.0
## Dalc         Dalc      <int> 604        45             6.9   1.5   0.9  1.0
## Walc         Walc      <int> 591        58             8.9   2.3   1.3  1.0
## health       health    <int> 604        45             6.9   3.5   1.5  1.0
## absences     absences <int> 636        13             2.0   3.7   4.7  0.0
## G3           G3       <int> 649         0             0.0  11.9   3.2  0.0
##
##          quartile_25 median quartile_75    max
## student_id      163.0   325.0      487.0 649.0
## age              16.0    17.0      18.0  22.0
## Medu             2.0     2.0       4.0   4.0
## Fedu             1.0     2.0       3.0   4.0
## traveltime       1.0     1.0       2.0   4.0
## studytime        1.0     2.0       2.0   4.0
## failures         0.0     0.0       0.0   3.0
## famrel           4.0     4.0       5.0   5.0
## freetime         3.0     3.0       4.0   5.0
## goout            2.0     3.0       4.0   5.0
## Dalc             1.0     1.0       2.0   5.0
## Walc            1.0     2.0       3.0   5.0
```

```
## health          2.0   4.0          5.0   5.0
## absences        0.0   2.0          6.0  32.0
## G3              10.0  12.0         14.0  19.0
##
## $Categorical
##      label var_type   n missing_n missing_percent levels_n levels
## school   school   <chr> 649         0           0.0         3      -
## sex       sex     <chr> 649         0           0.0         3      -
## address   address <chr> 649         0           0.0         3      -
## famsize   famsize <chr> 649         0           0.0         3      -
## Pstatus   Pstatus <chr> 649         0           0.0         3      -
## Mjob      Mjob    <chr> 649         0           0.0         6      -
## Fjob      Fjob    <chr> 649         0           0.0         6      -
## reason    reason  <chr> 649         0           0.0         5      -
## guardian  guardian <chr> 649         0           0.0         4      -
## schoolsup  schoolsup <chr> 649         0           0.0         3      -
## famsup     famsup  <chr> 649         0           0.0         3      -
## paid       paid    <chr> 649         0           0.0         3      -
## activities activities <chr> 649         0           0.0         3      -
## nursery    nursery <chr> 649         0           0.0         3      -
## higher     higher  <chr> 649         0           0.0         3      -
## internet   internet <chr> 649         0           0.0         3      -
## romantic   romantic <chr> 649         0           0.0         3      -
##      levels_count levels_percent
## school          -          -
## sex              -          -
## address          -          -
## famsize          -          -
## Pstatus          -          -
## Mjob             -          -
## Fjob             -          -
## reason           -          -
## guardian         -          -
## schoolsup        -          -
## famsup           -          -
## paid             -          -
## activities       -          -
## nursery          -          -
## higher           -          -
## internet         -          -
## romantic         -          -
```

Note: Each variable except *student_id* and *G3* has at least one missing value in this dataset.

Task 2.3 Most of the variables in this dataset are categorical, and particularly a binary variable with a Yes and No response. Check the frequency of unique values for all categorical variables. If there is any inconsistency (e.g., Yes is coded as both ‘y’ and ‘Y’) for any of these variables in terms of how values are coded, fix them. Also, check the distribution of numeric variables and make sure there is no anomaly.

```
table(dat$school)
```

```
##
##      GP  MS
##  32 400 217
```

```
table(dat$sex)
```

```
##  
##      F      M  
## 65 341 243
```

```
describe(dat$age)
```

```
##   vars   n mean   sd median trimmed  mad min max range skew kurtosis   se  
## X1     1 597 16.76 1.22    17   16.72 1.48  15  22     7 0.43     0.09 0.05
```

```
table(dat$address)
```

```
##  
##      R      U  
## 58 180 411
```

```
table(dat$famsize)
```

```
##  
##    GT3 LE3  
## 65 413 171
```

```
table(dat$Pstatus)
```

```
##  
##      A      T  
## 32  79 538
```

```
table(dat$Medu)
```

```
##  
##  0  1  2  3  4  
##  5 138 183 133 171
```

```
table(dat$Fedu)
```

```
##  
##  0  1  2  3  4  
##  6 172 203 127 122
```

```
table(dat$Mjob)
```

```
##  
##           at_home  health  other services  teacher  
##           13      133     47      255      131      70
```

```
table(dat$Fjob)
```

```
##  
##           at_home  health  other services  teacher  
##           13      41     23      359      178      35
```

```
table(dat$reason)
```

```
##  
##           course  home  other reputation  
##           6      283   149      72      139
```

```
table(dat$guardian)
```

```
##
```

```
##          father mother  other
##          52      134    423    40
```

```
table(dat$traveltime)
```

```
##
##    1    2    3    4
## 360 207  53  16
```

```
table(dat$studytime)
```

```
##
##    1    2    3    4
## 206 291  93  33
```

```
table(dat$failures) #there are no 4 values, seems like this may be incorrect
```

```
##
##    0    1    2    3
## 531  70  16  13
```

```
table(dat$schoolsup)
```

```
##
##      no yes
## 19 564  66
```

```
table(dat$famsup)
```

```
##
##      no yes
## 26 243 380
```

```
table(dat$paid)
```

```
##
##      no yes
## 13 599  37
```

```
table(dat$activities)
```

```
##
##      no yes
## 13 326 310
```

```
table(dat$nursery)
```

```
##
##      no yes
## 26 121 502
```

```
table(dat$higher)
```

```
##
##      no yes
## 65  65 519
```

```
table(dat$internet)
```

```
##
##      no yes
## 65 136 448
```

```
table(dat$romantic)
```

```
##  
##      no yes  
## 58 374 217
```

```
table(dat$famrel)
```

```
##  
##    1    2    3    4    5  
## 20  29 100 316 178
```

```
table(dat$freetime)
```

```
##  
##    1    2    3    4    5  
## 45 105 244 169  60
```

```
table(dat$goout)
```

```
##  
##    1    2    3    4    5  
## 47 141 200 133 109
```

```
table(dat$Dalc)
```

```
##  
##    1    2    3    4    5  
## 418 113  43  16  14
```

```
table(dat$Walc)
```

```
##  
##    1    2    3    4    5  
## 223 138 107  80  43
```

```
table(dat$health)
```

```
##  
##    1    2    3    4    5  
## 85  72 112 100 235
```

```
table(dat$absences)
```

```
##  
##    0    1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   18   21   22  
## 236  12 110   7  91  12  48   3  40   7  21   5  12   1   8   2  10   3   2   2  
##  24  26  30  32  
##    1    1    1    1
```

```
describe(dat$absences)
```

```
##      vars    n mean   sd median trimmed  mad min max range skew kurtosis   se  
## X1      1 636 3.69 4.66      2    2.82 2.97   0  32   32 2.01    5.66 0.18
```

```
table(dat$G3)
```

```
##  
##    0    1    5    6    7    8    9   10   11   12   13   14   15   16   17   18   19  
## 15    1    1    3   10   35   35   97  104   72   82   63   49   36   29   15    2
```

```
describe(dat$G3)
```

```
##      vars   n mean   sd median trimmed  mad min max range  skew kurtosis   se
## X1      1 649 11.91 3.23     12   12.04 2.97   0  19   19 -0.91     2.66 0.13
```

Below is a list of variables that should be treated as categorical (with a nominal scale):

- school
- sex
- address
- famsize
- Pstatus
- Mjob
- Fjob
- reason
- guardian
- schoolsup
- famsup
- paid
- activities
- nursery
- higher
- internet
- romantic

Below is a list of variables that should be treated as numeric (with an ordinal or continuous scale):

- Medu
- Fedu
- traveltime
- studytime
- failures
- famrel
- freetime
- goout
- Dalc
- Walc
- health
- age
- absences

The purpose is to check the observed data and make sure the observed data is aligned with the data dictionary and there are no unexpected or unusual values that are not consistent with what expect from data. If there is such data points, they have to be fixed or issued should be resolved before moving forward.

Task 2.4 Prepare a recipe using the `recipe()` and `prep()` functions from the `recipes` package for final transformation of the variables in this dataset.

Suppose that we categorize the variables in this datasets as the following:

- `student_id` is the ID variable
- `G3` is the outcome variable
- `Medu,Fedu,traveltime,studytime,failures,famrel,freetime,goout,Dalc,Walc,health,age,absences` are numeric predictors
- `school,sex,address,famsize,Pstatus,Mjob,Fjob,reason,guardian,schoolsup,famsup, paid,activities,nursery,hig` are all categorical predictors.


```

id <- c('student_id')
outcome <- c('G3')
numeric <- c('Medu','Fedu','traveltime','studytime','failures','famrel','freetime','goout','Dalc','Walc')
categorical <- c('school','sex','address','famsize','Pstatus','Mjob','Fjob','reason','guardian','school')

dat

```

##	student_id	school	sex	age	address	famsize	Pstatus	Medu	Fedu	Mjob
## 1	1	GP	F	18	U	GT3	A	4	4	at_home
## 2	2	GP	F	17	U	GT3	T	1	1	at_home
## 3	3	GP	F	15	U	LE3	T	1	1	at_home
## 4	4	GP	F	15	U	GT3	T	4	2	health
## 5	5	GP	F	16	U	GT3	T	3	3	other
## 6	6	GP	M	16	U	LE3	T	4	NA	services
## 7	7	GP	M	16	U	LE3	T	2	2	other
## 8	8	GP	F	17	U	GT3	A	4	4	other
## 9	9	GP	M	15		LE3	A	3	2	services
## 10	10	GP	M	15	U	GT3	T	3	4	other
## 11	11	GP	F	15	U	GT3	T	4	4	teacher
## 12	12	GP	F	15	U	GT3	T	2	1	services
## 13	13	GP	M	15	U	LE3	T	4	4	health
## 14	14			15	U	GT3	T	4	3	teacher
## 15	15			15	U	GT3	A	2	2	other
## 16	16	GP	F	16	U	GT3	T	4	4	health
## 17	17	GP		16	U	GT3	T	4	4	services
## 18	18	GP	F	16	U	GT3	T	3	3	other
## 19	19	GP	M	17	U	GT3	T	NA	2	services
## 20	20	GP	M	16	U	LE3	T	4	3	health
## 21	21	GP	M	15	U	GT3	T	4	3	teacher
## 22	22	GP	M	15	U	GT3	T	4	NA	health
## 23	23	GP	M	16	U	LE3	T	4	2	teacher
## 24	24	GP		16	U	LE3	T	2	2	other
## 25	25	GP	F	15	R	GT3	T	2	4	services
## 26	26	GP	F	16	U	GT3	T	2	2	services
## 27	27	GP	M	15	U	GT3	T	2	2	other
## 28	28	GP	M	15		GT3	T	4	2	health
## 29	29	GP	M	16	U	LE3	A	3	4	services
## 30	30	GP	M	16	U	GT3	T	4	4	teacher
## 31	31	GP	M	15	U	GT3	T	4	4	health
## 32	32	GP	M	15	U	GT3	T	4	4	services
## 33	33	GP	M	NA	R	GT3	T	4	3	teacher
## 34	34	GP	M	15	U	LE3	T	3	3	other
## 35	35		M	16		GT3		3	2	other
## 36	36		F	15	U	GT3		2	3	other
## 37	37	GP	M	15	U	LE3	T	4	3	teacher
## 38	38	GP	M	16	R	GT3	A	4	4	other
## 39	39	GP	F	15	R	GT3	T	3	4	services
## 40	40	GP	F	15	R		T	2	2	at_home
## 41	41	GP		16	U	LE3	T	2	2	other
## 42	42	GP	M	15	U	LE3	T	4	4	teacher
## 43	43	GP	M	15	U	GT3	T	4	4	services
## 44	44	GP	M	15		GT3	T	2	2	services
## 45	45	GP	F	16	U	LE3	T	2	2	other
## 46	46	GP	F	15	U		A	4	3	other

## 47	47	GP	F	16	U	LE3	A	3	3	other
## 48	48	GP	M	16	U	GT3	T	4	3	health
## 49	49	GP	M	15	U	GT3	T	4	2	teacher
## 50	50	GP	F	15	U	GT3	T	4	4	services
## 51	51	GP	F	16	U	LE3	T	2	2	services
## 52	52	GP	F	15	U	LE3	T	4	2	health
## 53	53	GP	M	15	U	LE3	A	4	2	health
## 54	54	GP	F	NA	U	GT3	T	4	4	services
## 55	55	GP	F	15	U	LE3	A	3	3	other
## 56	56	GP	F	16	U	GT3	A	2	1	other
## 57	57	GP	F	15	U	GT3	A	4	3	services
## 58	58	GP	M	15	U	GT3	T	4	4	teacher
## 59	59	GP	M	15	U	LE3	T	1	NA	other
## 60	60	GP	F	16	U	GT3		4	2	
## 61	61	GP	F	16	R	GT3	T	4	4	health
## 62	62	GP	F	16	U	GT3	T	1	1	services
## 63	63	GP	F	16	U	LE3	T	1	2	other
## 64	64	GP	F	16	U	GT3	T	4	3	teacher
## 65	65	GP	F	15	U	LE3	T	4	3	services
## 66	66	GP		16	U	LE3	T	4	3	teacher
## 67	67	GP		NA	U	GT3	A	4	4	
## 68	68	GP	F	16	U	GT3	T	3	1	services
## 69	69	GP	F	NA	R	LE3	T	2	2	health
## 70	70	GP		15	R	LE3	T	3	1	other
## 71	71	GP	M	NA	U	GT3	T	3	1	other
## 72	72	GP	M	15	U	GT3	T	4	2	other
## 73	73	GP	F	15		GT3	T	1	1	other
## 74	74	GP	M	16	U	GT3	T	3	1	other
## 75	75	GP	F	16	U	GT3	T	3	3	other
## 76	76	GP	M	NA	U	GT3	T	4	3	teacher
## 77	77	GP	M	15	U	GT3	T	4	0	teacher
## 78	78		F	16	U	GT3	T	2	2	other
## 79	79	GP	M	17		GT3	T	2	1	other
## 80	80	GP	F	16	U	GT3	T	NA	4	at_home
## 81	81	GP		15	U	GT3	T	2	3	other
## 82	82	GP	M	15	U	GT3	T	2	3	other
## 83	83	GP	F	15	U	LE3	T	3	2	services
## 84	84	GP	M	15	U	LE3	T	2	2	services
## 85	85	GP	F	15		GT3	T	1	1	other
## 86	86	GP	F	15	U	GT3	T	4	4	services
## 87	87	GP	F	16	U	LE3	T	NA	2	at_home
## 88	88	GP	F	15		GT3	T	4	2	other
## 89	89	GP	M	16	U	GT3	T	2	2	services
## 90	90	GP	M	16	U	LE3	A	4	4	teacher
## 91	91	GP	F	16	U	GT3	T	3	3	other
## 92	92	GP	F	15		GT3	T	4	3	services
## 93	93	GP	F	NA		LE3	T	3	1	other
## 94	94		F	16	U	GT3	T	4	2	teacher
## 95	95	GP	M	15	U	LE3	T	2	2	services
## 96	96	GP	F	15	R		T	1	1	at_home
## 97	97	GP	M	16	R	GT3	T	4	3	services
## 98	98	GP	F	16	U	GT3	T	2	1	other
## 99	99	GP		16	U	GT3		NA	4	other
## 100	100	GP		16	U		T	4	3	other

## 101	101	GP	M	16	U	GT3	T	4	4	services
## 102	102	GP	M	16	U	GT3	T	4	4	services
## 103	103	GP	M	15	U	GT3	T	4	4	services
## 104	104	GP	F	15		GT3	T	3	2	services
## 105	105	GP	M	15	U	GT3	A	3	4	services
## 106	106	GP	F	15	U		A	3	3	other
## 107	107	GP	F	NA	U	GT3	T	2	2	other
## 108	108	GP	M	16	U	GT3	T	3	3	services
## 109	109	GP	M	15	R		T	4	4	other
## 110	110		F	16	U	LE3	T	4	4	health
## 111	111	GP	M	15	U	LE3	A	4	4	teacher
## 112	112	GP	F	16	R	GT3	T	3	3	services
## 113	113	GP	F	16	U	GT3	T	2	2	at_home
## 114	114	GP	M	15	U	LE3	T	4	2	teacher
## 115	115	GP	M	15	R	GT3	T	2	1	health
## 116	116	GP		16	U	GT3	T	4	4	teacher
## 117	117	GP	M	NA		GT3	T	4	4	other
## 118	118	GP	M	16	U	GT3		3	3	other
## 119	119	GP	M	17	R	GT3	T	1	3	other
## 120	120	GP	M	NA	U	GT3	T	NA	4	other
## 121	121	GP	F	15		GT3	T	1	2	at_home
## 122	122	GP	M	NA	U	GT3	T	2	2	services
## 123	123	GP	F	16	U	LE3	T	2	4	other
## 124	124	GP		16	U	GT3	T	4	4	health
## 125	125	GP	F	16	U	GT3	T	2	2	other
## 126	126	GP	M	15	U	GT3	T	3	4	services
## 127	127	GP	F	15	U		A	3	4	other
## 128	128	GP	F	19	U	GT3	T	0	1	at_home
## 129	129	GP	M	16	R	GT3	T	4	4	teacher
## 130	130	GP		16	U	GT3		2	3	other
## 131	131	GP		15	R	GT3	T	3	4	services
## 132	132	GP	F	18	U	GT3	T	2	1	services
## 133	133	GP	F	17	U	LE3	A	2	1	other
## 134	134	GP	F	NA	U	GT3	T	1	1	at_home
## 135	135	GP	F	17	U	LE3	T	2	2	other
## 136	136	GP	F	16	U	GT3	A	3	4	services
## 137	137	GP	M	16	U	GT3	T	2	1	at_home
## 138	138	GP	F	16		GT3	A	2	2	other
## 139	139	GP	M	15	R	GT3	T	3	4	at_home
## 140	140	GP	F	15	U	GT3	T	4	4	services
## 141	141	GP	M	17	R	GT3	T	3	4	at_home
## 142	142	GP	F	16	R	GT3	T	1	1	at_home
## 143	143	GP	M	18	U	LE3	T	3	1	
## 144	144	GP	F	18	U	GT3	A	3	NA	other
## 145	145	GP	F	16	R	GT3	T	1	1	other
## 146	146	GP	F	16	U	GT3	A	3	3	other
## 147	147			16	U	LE3	T	1	1	services
## 148	148	GP	F	15	U	GT3	T	4	4	teacher
## 149	149		F	15	R		T	1	1	other
## 150	150	GP	M	15	U	GT3	T	4	3	
## 151	151	GP	F	15	U		A	3	3	services
## 152	152	GP	M	16	U	GT3	T	4	4	services
## 153	153	GP	M	16	U	LE3	T	2	2	services
## 154	154	GP	F	15	U	GT3	T	4	4	teacher

## 155	155	GP	F	16	U		T	1	1	at_home
## 156	156	GP	M	NA	U	GT3	T	2	1	other
## 157	157	GP	F	15	U	GT3	T	1	1	other
## 158	158		F	15	U	LE3	A	2	1	at_home
## 159	159	GP	F	15	U	GT3	T	3	2	health
## 160	160	GP	F	15	U	GT3	T	1	2	at_home
## 161	161	GP	F	15	U	GT3	T	1	2	at_home
## 162	162	GP	M	16	U	GT3	T	4	4	teacher
## 163	163	GP	M	15		LE3		2	1	services
## 164	164	GP		18	U	LE3	T	NA	1	other
## 165	165	GP	M	16	U	LE3	T	2	1	at_home
## 166	166	GP	F	15	R	GT3	T	3	3	services
## 167	167	GP	M	19	U	GT3	T	3	2	services
## 168	168	GP	F	17	U		T	4	4	other
## 169	169	GP	M	15	R		T	2	3	at_home
## 170	170	GP	M	17	R	LE3	T	1	2	other
## 171	171	GP	F	18	R	GT3	T	1	1	at_home
## 172	172	GP	M	16			T	2	2	at_home
## 173	173	GP	M	16	U	GT3	T	3	3	other
## 174	174	GP	M	16	U	LE3	T	1	2	health
## 175	175	GP	M	17	R	LE3	T	2	1	at_home
## 176	176	GP	M	17	R		T	3	2	other
## 177	177	GP	M	15	U	LE3	T	1	2	other
## 178	178	GP	M	16		GT3	T	1	3	at_home
## 179	179	GP	M	17	R	LE3	T	1	1	other
## 180	180	GP	M	NA	U	GT3	T	3	2	services
## 181	181	GP		16	U	GT3	T	2	2	other
## 182	182	GP	F	16	U	GT3	T	4	2	health
## 183	183	GP	F	16	U	GT3	T	2	2	other
## 184	184	GP	F	NA	U	GT3	T	4	4	health
## 185	185	GP		16	U	GT3	T	3	4	other
## 186	186	GP	M	16	U	GT3	T	1	NA	other
## 187	187	GP	M	17	U	LE3	T	4	4	teacher
## 188	188	GP	F	16	U	GT3		1	3	at_home
## 189	189			16	U	LE3	T	3	3	other
## 190	190	GP	M	17	U		T	4	3	teacher
## 191	191	GP	F	16	U	GT3	T	2	2	services
## 192	192	GP	M	NA		GT3	T	3	3	other
## 193	193	GP	M	NA	R	GT3	T	4	2	teacher
## 194	194	GP	M	17	U	GT3	T	4	3	other
## 195	195			16	U	GT3	T	4	3	teacher
## 196	196	GP	M	16	U	GT3	T	3	3	services
## 197	197	GP	F	17	U	GT3	T	2	NA	services
## 198	198	GP	F	17	U		T	3	3	other
## 199	199	GP		16	U	GT3	T	3	2	other
## 200	200	GP	M	NA	U	GT3	T	3	3	services
## 201	201	GP	M	16	U	GT3	T	1	2	
## 202	202	GP	M	16	U	LE3	T	2	1	other
## 203	203		F	17	U	GT3	A	3	3	health
## 204	204	GP	M	17	R	GT3	T	1	2	at_home
## 205	205	GP	F	16	U		T	2	3	services
## 206	206	GP	F	17	U	GT3	T	1	1	at_home
## 207	207	GP	M	17	U	GT3	T	1	2	at_home
## 208	208	GP	M	16	R	GT3	T	3	3	services

## 209	209	GP	M	16	U	GT3	T	2	3	other
## 210	210	GP	F	17	U	LE3	T	2	4	services
## 211	211	GP	M	17	U	GT3	T	4	4	services
## 212	212	GP	M	16	R		T	3	3	teacher
## 213	213	GP	F	17	U	GT3	T	4	4	services
## 214	214		F	16	U	LE3	T	4	4	teacher
## 215	215	GP	F	16	U		T	4	3	health
## 216	216	GP	F	16	U	GT3	T	2	3	other
## 217	217	GP	F	17	U	GT3	T	1	1	other
## 218	218	GP	F	17	R	GT3	T	2	2	other
## 219	219	GP	F	16	R	GT3	T	2	2	services
## 220	220	GP	F	17	U	GT3	T	3	4	at_home
## 221	221	GP	F	16	U	GT3	A	3	1	services
## 222	222	GP	F	16	U	GT3	T	4	3	teacher
## 223	223	GP		16	U	GT3	T	1	1	at_home
## 224	224	GP	F	NA	R	GT3	T	4	3	teacher
## 225	225	GP		19		GT3	T	3	3	other
## 226	226	GP	M	17	U	LE3	T	4	4	
## 227	227	GP	F	16	U	GT3	A	2	2	other
## 228	228	GP	M	18	U	GT3	T	2	2	services
## 229	229	GP	F	17	R	LE3	T	4	4	services
## 230	230	GP	F	17	U	LE3	T	NA	2	other
## 231	231	GP	F	17	U	GT3	T	4	3	other
## 232	232	GP	M	18	U	LE3	T	3	3	services
## 233	233	GP	F	17	U	GT3	T	2	3	at_home
## 234	234	GP	F	17	U		T	2	2	at_home
## 235	235	GP	F	17	R	GT3	T	2	1	at_home
## 236	236	GP	F	17	U	GT3	T	1	1	at_home
## 237	237	GP		16	U	GT3	T	2	3	services
## 238	238	GP	M	18	U	GT3	T	2	2	other
## 239	239	GP	F	16	U	GT3	T	4	4	teacher
## 240	240		F	18	R	GT3	T	3	1	other
## 241	241	GP	F	17	U	GT3	T	3	2	other
## 242	242	GP	M	17	U	LE3	T	2	3	services
## 243	243	GP		18	U	LE3	T	2	1	at_home
## 244	244	GP	F	17	U	GT3	A	2	1	other
## 245	245	GP		17	U	LE3	T	4	3	health
## 246	246	GP	M	17	R	GT3	T	2	2	other
## 247	247	GP	M	17		GT3		4	4	teacher
## 248	248	GP	M	16	U	GT3	T	4	4	health
## 249	249			16	U	LE3	T	1	1	other
## 250	250	GP	M	16		GT3	T	3	2	at_home
## 251	251	GP	M	17	U	LE3	T	2	2	other
## 252	252	GP		16	U	GT3	T	2	1	other
## 253	253	GP	F	16	U	GT3	A	4	1	other
## 254	254	GP	F	18	U	LE3	A	2	4	services
## 255	255		F	NA	U		T	2	2	at_home
## 256	256	GP	F	18	U		T	3	3	other
## 257	257	GP	M	NA	U	GT3	T	2	2	other
## 258	258	GP	M	17		GT3	T	4	4	teacher
## 259	259	GP	F	17			T	3	2	other
## 260	260	GP	F	17	U	LE3	T	1	1	at_home
## 261	261	GP	F	16	U	GT3	T	1	2	other
## 262	262	GP	F	17	R	GT3	T	2	1	at_home

## 263	263	GP	F	17	R	LE3	A	1	4	other
## 264	264	GP	M	18	U		T	2	NA	other
## 265	265	GP	F	17	U	LE3	A	2	2	other
## 266	266		F	17	R	LE3	T	1	1	at_home
## 267	267	GP	F	17	U	LE3	A	4	2	teacher
## 268	268	GP	M	17	U	LE3	T	4	3	health
## 269	269	GP	M	17	R	LE3	A	4	4	teacher
## 270	270	GP	M	16	U	LE3	T	4	3	teacher
## 271	271	GP	M	16	U	GT3	T	4	4	services
## 272	272	GP	F	17	U	GT3	T	4	4	teacher
## 273	273	GP	M	NA	R	GT3	T	1	1	other
## 274	274	GP	F	17	U	GT3	T	3	3	services
## 275	275	GP	F	17		GT3	T	1	1	at_home
## 276	276	GP	F	18	U	GT3	T	2	1	other
## 277	277	GP	M	16	U	GT3	T	2	1	other
## 278	278	GP	F	17	U	GT3	T	1	1	other
## 279	279	GP	M	NA		GT3	T	2	3	other
## 280	280	GP	M	22	U	GT3	T	3	1	services
## 281	281	GP	M	18		LE3	T	3	3	other
## 282	282	GP	M	16	U	GT3	T	0	2	other
## 283	283	GP		18	U	GT3	T	3	2	services
## 284	284	GP	M	16	U	GT3	T	3	3	at_home
## 285	285	GP	M	18		GT3	T	2	1	services
## 286	286	GP	M	16	R	GT3	T	2	1	other
## 287	287	GP	M	17	R	GT3		2	1	other
## 288	288	GP	M	17	U	LE3	T	1	1	health
## 289	289	GP	F	18		LE3	A	2	1	other
## 290	290	GP	F	17	U	LE3	T	4	2	
## 291	291	GP	F	19	U	GT3	T	2	2	services
## 292	292	GP	M	18		LE3	T	2	1	services
## 293	293	GP	F	17	R	GT3	T	4	2	other
## 294	294	GP	F	18	U	LE3	T	1	1	other
## 295	295	GP	F	NA	R	GT3	T	2	2	other
## 296	296	GP	M	19	U	LE3	A	4	3	services
## 297	297	GP	M	NA	U	GT3		2	1	other
## 298	298	GP	M	17	R	GT3	T	2	2	other
## 299	299	GP		17	U	LE3	T	2	2	services
## 300	300	GP	F	20	R	GT3	T	2	1	other
## 301	301	GP	F	18	U	GT3	T	4	3	services
## 302	302	GP	M	18	U	GT3	T	4	3	teacher
## 303	303	GP	M	18		GT3	T	3	2	other
## 304	304	GP		17	U	GT3	T	3	3	other
## 305	305	GP	F	18	U	GT3	T	2	2	at_home
## 306	306	GP	M	17	U	GT3	T	2	2	other
## 307	307	GP	M	18	R	LE3	A	NA	4	other
## 308	308	GP	M	17	U	GT3	T	3	1	services
## 309	309	GP	F	18	R	GT3	T	4	4	teacher
## 310	310	GP	M	18	U	GT3	T	4	2	health
## 311	311	GP	F	18	R		T	2	1	other
## 312	312	GP	F	19	U	GT3	T	3	3	other
## 313	313	GP	F	18	U		T	2	3	other
## 314	314	GP	F	18	U	LE3	T	1	1	other
## 315	315	GP	M	17	R	GT3	T	1	2	at_home
## 316	316	GP	F	18	U		T	2	1	

## 317	317	GP	F	17	U	GT3	T	NA	4	at_home
## 318	318	GP		17	U	LE3	T	2	2	services
## 319	319	GP	F	NA	R	GT3	A	3	2	other
## 320	320	GP	M	18	U	GT3	T	4	4	teacher
## 321	321	GP	F	18	U	GT3	T	4	4	health
## 322	322	GP	F	17	U	GT3	T	2	2	other
## 323	323	GP	F	19	R	GT3	T	3	2	services
## 324	324	GP	M	18	U	LE3	T	4	3	teacher
## 325	325	GP	M	18	U	GT3	T	1	2	at_home
## 326	326	GP	M	17	U	LE3	A	4	1	services
## 327	327	GP	M	17	U	LE3	A	3	2	teacher
## 328	328	GP	F	18	R	LE3		1	1	
## 329	329	GP	F	18		GT3	T	1	1	other
## 330	330	GP	F	NA	U	GT3	T	2	2	other
## 331	331			18	U	GT3	T	NA	1	other
## 332	332	GP	M	17	U		T	1	1	other
## 333	333	GP	F	18	U	GT3	T	2	2	at_home
## 334	334	GP	F	17	U	GT3	T	1	1	services
## 335	335		M	18	U	GT3	T	2	1	services
## 336	336	GP	M	18	U	LE3	A	4	4	teacher
## 337	337	GP	M	18	U	GT3	T	4	2	teacher
## 338	338	GP	F	17	U	GT3	T	4	3	
## 339	339	GP	F	17	R	LE3	T	3	1	services
## 340	340	GP	M	18	R	LE3	T	3	2	services
## 341	341	GP	M	17		GT3	T	3	3	health
## 342	342	GP	F	19	U	GT3	T	4	4	health
## 343	343	GP	F	18	U		T	4	NA	other
## 344	344	GP	F	18	U	GT3	T	4	NA	other
## 345	345	GP	M	18	U	LE3	T	4	4	teacher
## 346	346	GP	F	18	U	LE3	A	4	4	health
## 347	347	GP	M	17	U	LE3	T	4	4	other
## 348	348	GP	F	17	R	GT3	T	4	4	services
## 349	349	GP	F	17	U	GT3	T	4	2	other
## 350	350	GP	F	17	U		T	3	2	health
## 351	351	GP	M	19	R	LE3	T	2	1	at_home
## 352	352	GP	M	20	U	GT3	A	3	2	services
## 353	353	GP		19	R	GT3	T	3	3	other
## 354	354	GP	F	18	U	GT3	T	1	4	other
## 355	355	GP	F	18	U	GT3	T	2	1	services
## 356	356	GP	F	17	U	GT3	T	2	3	other
## 357	357	GP	F	17	R	GT3	T	4	4	teacher
## 358	358	GP	F	NA		GT3	T	4	3	other
## 359	359	GP	F	18	U	LE3	T	4	3	health
## 360	360	GP	F	17	R	GT3	T	3	4	at_home
## 361	361	GP		18	U	GT3	T	3	3	at_home
## 362	362	GP	M	19		GT3	T	4	2	health
## 363	363	GP	F	18	U	GT3	T	4	NA	teacher
## 364	364	GP	F	18	U	GT3	T	3	4	other
## 365	365	GP	F	17	U	GT3	T	4	4	health
## 366	366	GP	F	17		GT3	A	4	3	services
## 367	367	GP		17	U	LE3	A	3	3	services
## 368	368	GP	F	17	U	LE3	T	2	1	other
## 369	369	GP	M	18	U	LE3	T	NA	4	other
## 370	370		F	19	U	GT3	T	1	1	other

## 371	371	GP	F	NA	U	LE3	A	1	NA	other
## 372	372	GP	F	18	U	GT3	T	2	2	other
## 373	373		F	17	U	GT3	T	2	2	other
## 374	374	GP	F	17		LE3	T	2	2	services
## 375	375	GP	F	17	U	GT3	T	3	1	services
## 376	376	GP	F	17	U	LE3	T	0	2	at_home
## 377	377	GP	F	18	U	GT3		1	1	other
## 378	378			18	U	GT3	T	4	4	other
## 379	379	GP	M	17	U	GT3	T	3	3	other
## 380	380	GP	M	17	R	GT3	T	2	2	services
## 381	381	GP	F	NA	U	GT3	T	4	4	teacher
## 382	382	GP		17	U	GT3	T	4	NA	teacher
## 383	383	GP	F	17	U	GT3	T	3	3	at_home
## 384	384	GP	M	18	U	LE3	T	2	2	other
## 385	385	GP	M	19	R	GT3	T	3	2	at_home
## 386	386	GP	F	18	U	GT3	T	2	2	at_home
## 387	387	GP	F	17	R	GT3	T	2	4	at_home
## 388	388	GP	M	18	U	GT3	T	2	2	other
## 389	389	GP		18	U	GT3	T	3	3	services
## 390	390	GP	F	18		LE3	T	2	2	other
## 391	391	GP	F	18	R	GT3	T	2	2	at_home
## 392	392	GP		17	U			3	4	services
## 393	393	GP	F	17	U	GT3	T	3	2	other
## 394	394	GP	F	18	U	LE3	T	3	3	services
## 395	395	GP	F	17	R	GT3	A	3	2	other
## 396	396	GP	M	18	U	GT3	T	4	4	teacher
## 397	397	GP	M	18	U	LE3	T	3	4	services
## 398	398	GP	F	17	U		A	2	2	at_home
## 399	399	GP	F	18	U	GT3		2	3	at_home
## 400	400	GP	F	18	U	GT3	T	3	2	other
## 401	401	GP	M	18		GT3	T	4	3	teacher
## 402	402	GP	M	18	U	GT3	T	4	3	teacher
## 403	403	GP	F	17	U	GT3	T	4	3	health
## 404	404	GP	F	17	U	GT3		2	1	services
## 405	405	GP		17	U	GT3	T	2	1	services
## 406	406	GP	F	19	U	LE3	A	2	3	at_home
## 407	407	GP	F	17	U	GT3	T	3	1	other
## 408	408	GP	F	21	U	LE3	T	4	4	other
## 409	409	GP	M	NA	U	LE3	T	2	2	services
## 410	410	GP	M	18	U	LE3	A	3	4	other
## 411	411	GP	F	17	U	GT3		2	2	services
## 412	412	GP	M	17	U	LE3	A	NA	4	health
## 413	413	GP	F	NA	U	LE3	T	4	2	teacher
## 414	414	GP	M	21	R	LE3	T	1	1	at_home
## 415	415	GP	F	20	R	GT3	T	1	1	other
## 416	416	GP	F	19	U	GT3		4	4	teacher
## 417	417	GP	M	17	U	LE3	A	3	2	other
## 418	418	GP	F	18	U	GT3		3	2	at_home
## 419	419	GP	M	18	R	GT3	T	2	3	other
## 420	420	GP	M	19	U	GT3	T	2	1	other
## 421	421	GP	F	18	U	LE3	A	2	2	services
## 422	422	GP	F	20	U	GT3	T	1	0	other
## 423	423	GP	F	18		GT3	T	3	2	services
## 424	424		F	16	U	GT3	T	1	3	at_home

## 425	425	MS	F	16	R	GT3	T	2	2	other
## 426	426	MS	F	15		GT3	T	1	1	at_home
## 427	427	MS	F	15	R			3	3	at_home
## 428	428	MS	F	16	R	GT3	T	2	3	at_home
## 429	429	MS	F	15	R	LE3	T	2	1	at_home
## 430	430	MS	M	16	R	LE3	A	4	4	at_home
## 431	431	MS	M	16	U	GT3	A	1	2	other
## 432	432	MS	F	NA	R	GT3		3	2	at_home
## 433	433	MS	F	17	R	GT3	T	1	1	other
## 434	434	MS	F	15	R	GT3	T	4	NA	teacher
## 435	435	MS	F	16	U	LE3	A	2	2	at_home
## 436	436	MS	F	15	R	LE3	T	1	1	at_home
## 437	437	MS	F	15		LE3	T	1	1	
## 438	438	MS	F	16	R	GT3	T	0	2	other
## 439	439	MS	F	17	R	GT3		2	3	other
## 440	440	MS	F	15	R	GT3	T	3	3	other
## 441	441	MS	M	16	U	GT3	T	1	1	at_home
## 442	442		M	17	U	GT3	T	1	1	other
## 443	443	MS	M	15	R	LE3	T	4	1	health
## 444	444	MS	M	15	R	LE3		4	1	health
## 445	445	MS	M	16	R	GT3	T	3	4	other
## 446	446	MS	M	15	R	GT3	T	1	1	other
## 447	447	MS	M	15		LE3	T	3	3	at_home
## 448	448	MS	M	17	R	GT3	T	2	1	other
## 449	449	MS		16	R	GT3	T	4	4	teacher
## 450	450		F	15	R	GT3	T	1	2	other
## 451	451	MS	F	16	R	GT3	T	2	3	other
## 452	452	MS	M	16		GT3	T	1	2	other
## 453	453	MS	F	16		GT3	T	2	2	other
## 454	454			16	U	GT3		1	2	other
## 455	455	MS	F	16	U	GT3		1	2	other
## 456	456	MS	F	15	U	GT3	T	2	1	at_home
## 457	457	MS	F	16	U	GT3	T	1	1	at_home
## 458	458	MS	M	17	R		T	1	2	at_home
## 459	459	MS	F	16	R		T	1	1	other
## 460	460	MS	F	NA	R	GT3	T	1	1	at_home
## 461	461	MS	F	NA	R	GT3	T	1	1	at_home
## 462	462	MS	F	16		GT3	T	1	1	at_home
## 463	463	MS	F	15	R	GT3	T	1	1	at_home
## 464	464	MS	F	NA	R	LE3	T	2	2	other
## 465	465	MS	M	16	R	GT3	T	1	1	at_home
## 466	466	MS		18	U	GT3	T	1	2	other
## 467	467	MS	M	15		GT3	T	3	1	other
## 468	468	MS	F	16	R	GT3	T	2	2	other
## 469	469	MS	M	15	U	GT3	T	2	2	health
## 470	470	MS	M	16	U	GT3	T	4	4	other
## 471	471		F	15	R	GT3		3	3	services
## 472	472	MS	F	16	R		T	2	2	at_home
## 473	473	MS	F	16	R		T	2	2	other
## 474	474	MS	M	16	U	LE3	T	2	1	at_home
## 475	475	MS	M	15	R		T	1	3	at_home
## 476	476	MS	F	15		GT3	T	2	2	other
## 477	477	MS	F	16	R			2	1	other
## 478	478	MS		15	U	GT3	T	3	NA	services

## 479	479	MS	F	16	R		T	1	1	at_home
## 480	480	MS	F	17	U	GT3	T	2	2	other
## 481	481	MS	F	19	U	GT3	T	2	3	at_home
## 482	482	MS	F	17	R	GT3	T	2	1	at_home
## 483	483	MS		15	R	LE3	T	1	1	at_home
## 484	484	MS	F	16	R	GT3	T	2	2	other
## 485	485	MS	F	16	U		A	2	2	other
## 486	486	MS	F	17	R	GT3	T	2	2	at_home
## 487	487	MS	F	16	U	GT3	T	2	2	other
## 488	488	MS	F	18	R	LE3	A	3	2	other
## 489	489	MS	F	19	U	GT3	T	1	1	at_home
## 490	490	MS	M	18	R	GT3	T	1	1	other
## 491	491	MS	F	18	R	GT3	T	1	1	at_home
## 492	492	MS	F	19	U	GT3	T	1	1	other
## 493	493	MS	F	NA	R		A	2	2	health
## 494	494	MS	F	17	U	GT3	T	NA	1	other
## 495	495	MS	F	NA	R	LE3	T	1	2	at_home
## 496	496	MS	F	16	U		T	NA	3	other
## 497	497	MS	F	16	R	LE3	T	1	1	services
## 498	498	MS	M	NA	U	GT3	T	3	3	services
## 499	499	MS	F	16	U		T	2	1	other
## 500	500	MS	F	16	U	GT3	T	2	2	services
## 501	501	MS		NA	U	GT3		NA	2	other
## 502	502	MS	M	16	U	LE3	T	4	3	other
## 503	503	MS	M	17	R	LE3	T	2	2	services
## 504	504	MS	F	16	U	GT3	T	1	1	other
## 505	505	MS	F	19	U	LE3	T	2	2	other
## 506	506	MS	F	17	R	GT3	T	1	1	at_home
## 507	507	MS	F	NA	U	GT3	T	3	3	at_home
## 508	508	MS	F	17	U	LE3	T	1	1	other
## 509	509	MS	M	17	R	GT3	T	2	2	other
## 510	510	MS	F	16	R	LE3	T	1	1	at_home
## 511	511	MS	F	17	R	GT3	T	2	2	other
## 512	512	MS	F	17	U	GT3	A	1	0	other
## 513	513	MS		18	R	GT3	T	1	1	at_home
## 514	514	MS	F	16	U	GT3	T	3	1	other
## 515	515	MS	F	16	U	GT3	T	3	2	services
## 516	516	MS		18	U	LE3	T	1	NA	other
## 517	517	MS	F	16	R	GT3	T	4	4	health
## 518	518	MS	F	16	R	LE3	T	1	2	other
## 519	519	MS	F	18	U	GT3	A	2	4	other
## 520	520	MS	M	16	R	GT3	T	2	1	other
## 521	521	MS	F	16	U		T	1	1	at_home
## 522	522	MS	F	16	R	GT3	T	2	3	
## 523	523	MS	F	16	U	GT3		4	4	health
## 524	524	MS	M	18	U	LE3	T	4	4	at_home
## 525	525	MS	F	16	R	LE3	T	3	4	at_home
## 526	526	MS	M	17	U	LE3	T	4	4	other
## 527	527	MS	F	17	R	GT3	T	4	1	other
## 528	528	MS	M	16	U	LE3	T	2	NA	services
## 529	529	MS	F	17	R	GT3	T	2	2	at_home
## 530	530	MS	F	16	U	LE3	T	4	4	services
## 531	531	MS		17	U	GT3	T	3	3	services
## 532	532	MS	M	17	U		T	1	1	at_home

## 533	533	MS	M	16	U	GT3	T	2	1	health
## 534	534	MS		16	U		T	2	1	other
## 535	535	MS	M	16	U	LE3	T	4	4	teacher
## 536	536	MS	M	NA	R	GT3	T	1	2	other
## 537	537	MS	M	15	U	LE3	A	2	2	other
## 538	538	MS	M	NA	U	LE3	A	2	1	
## 539	539	MS		16	R	LE3	T	2	2	other
## 540	540	MS		NA	U	LE3	T	4	1	other
## 541	541	MS	F	17		GT3	T	3	2	at_home
## 542	542	MS	F	17		GT3	T	2	2	other
## 543	543	MS	F	16	U	GT3	T	4	4	teacher
## 544	544	MS	M	17	R	GT3	T	4	4	health
## 545	545	MS	M	17		LE3	T	1	3	other
## 546	546	MS	M	17	U		T	3	4	services
## 547	547	MS	F	17	U	GT3	T	4	4	health
## 548	548	MS	M	16	R	LE3	T	4	1	other
## 549	549	MS	F	17	U	GT3	A	1	1	at_home
## 550	550			17	R	GT3	T	4	NA	other
## 551	551	MS	M	16	U	LE3	A	2	2	other
## 552	552	MS	M	17	U	GT3	T	3	2	other
## 553	553	MS	M	19	U	GT3	T	1	1	other
## 554	554	MS	M	17	U	LE3	A	1	0	other
## 555	555	MS	F	17	R	GT3	T	1	1	at_home
## 556	556	MS	F	16	R	GT3	T	NA	2	other
## 557	557	MS	M	NA	R	LE3	T	1	2	other
## 558	558	MS	F	17	R	GT3	T	3	1	other
## 559	559	MS	M	17		GT3	T	2	2	other
## 560	560	MS	M	18	R	GT3	T	1	0	at_home
## 561	561	MS	M	17		GT3	T	1	1	other
## 562	562	MS	M	18	U	LE3	T	1	1	at_home
## 563	563	MS	F	16	R	LE3	T	2	2	other
## 564	564	MS	M	17	U	GT3	T	2	2	other
## 565	565	MS	M	16	R	GT3	T	3	2	services
## 566	566	MS	M	16	R		T	1	1	at_home
## 567	567		M	18	R		T	1	1	services
## 568	568	MS	M	18	R	GT3	T	3	2	services
## 569	569	MS	M	19	U	GT3	T	3	2	at_home
## 570	570	MS	M	18	U		T	3	3	at_home
## 571	571	MS	M	16	R	GT3	T	2	2	services
## 572	572	MS	M	19	U	GT3	T	2	1	at_home
## 573	573	MS	F	16	U	GT3	A	3	2	services
## 574	574	MS	F	NA	U		T	1	1	other
## 575	575	MS	M	20	R	GT3	T	1	1	other
## 576	576	MS	F	18	R	GT3	A	4	3	services
## 577	577	MS	M	18	R	GT3	T	3	2	other
## 578	578	MS	M	19	R		T	1	1	other
## 579	579	MS	M	17	U	GT3	T	3	3	health
## 580	580	MS		18	U		T	1	3	at_home
## 581	581	MS		19	R	GT3	T	1	1	other
## 582	582	MS	F	18		GT3	A	1	NA	at_home
## 583	583	MS	F	19	U	LE3	A	1	1	at_home
## 584	584	MS	F	18	R	GT3	T	2	2	other
## 585	585	MS	F	17	R	GT3	T	0	0	at_home
## 586	586	MS	F	17	R	LE3	A	3	1	other

## 587	587	MS	F	17	U	GT3	T	4	2	teacher
## 588	588	MS	F	18			T	2	2	services
## 589	589	MS	F	NA	U		T	4	1	health
## 590	590	MS	F	NA	U	LE3	T	1	2	at_home
## 591	591	MS	F	18	U	GT3	T	1	1	other
## 592	592	MS	F	18	U	GT3	T	2	2	services
## 593	593	MS		17	U	GT3	T	3	3	services
## 594	594	MS	F	18	U	LE3	A	1	2	at_home
## 595	595	MS	F	18	U	GT3	T	4	4	teacher
## 596	596	MS	M	18	U	LE3	T	NA	4	services
## 597	597	MS	F	17	U	GT3	T	4	2	other
## 598	598	MS		18	R		T	2	2	at_home
## 599	599	MS	M	18	U	LE3	T	1	2	at_home
## 600	600	MS	M	18	R	GT3	T	4	4	at_home
## 601	601	MS	M	17		GT3	T	1	1	other
## 602	602	MS	F	18	U	GT3	T	2	2	other
## 603	603	MS	F	18	U	LE3	T	2	2	services
## 604	604	MS		18	R	LE3	A	4	2	teacher
## 605	605	MS	F	18	U	GT3	T	1	1	at_home
## 606	606	MS	F	19	U	GT3	T	1	1	at_home
## 607	607	MS	F	17	U	GT3		4	2	teacher
## 608	608	MS	F	17	R	LE3	A	2	1	services
## 609	609	MS	F	18	U		A	1	1	at_home
## 610	610	MS		18	U	GT3	T	1	2	at_home
## 611	611	MS	F	19	R		A	1	1	at_home
## 612	612	MS	F	18	R	GT3	T	2	2	services
## 613	613	MS	M	17	R	GT3	T	4	3	services
## 614	614	MS	F	18	U	GT3	T	3	3	services
## 615	615		F	17	R	GT3	T	4	4	teacher
## 616	616	MS		NA	U	LE3	A	3	2	services
## 617	617	MS	M	18		LE3		NA	1	other
## 618	618	MS	F	18	U	LE3	T	1	1	at_home
## 619	619	MS	F	18	R	LE3	A	1	2	at_home
## 620	620	MS		18	U		T	3	3	services
## 621	621	MS		17	U	LE3	T	4	NA	at_home
## 622	622			17	R	GT3	T	1	2	other
## 623	623	MS	M	18	R		T	NA	3	at_home
## 624	624	MS	M	18	U	LE3	T	4	4	teacher
## 625	625	MS	F	17	R	GT3	T	1	1	other
## 626	626	MS	F	NA		GT3	T	2	3	at_home
## 627	627	MS	F	18	R	GT3	T	4	4	other
## 628	628	MS	M	18	R	LE3	T	1	2	at_home
## 629	629	MS	F	17	U	GT3	T	2	2	other
## 630	630	MS	F	17	R	GT3	T	1	2	other
## 631	631	MS	F	NA	R	LE3	T	4	4	other
## 632	632	MS	F	18	R	GT3	T	1	1	other
## 633	633	MS	F	19	R	GT3	T	1	1	at_home
## 634	634	MS	F	18	R		T	4	4	teacher
## 635	635	MS	F	18	U	GT3	T	3	3	other
## 636	636	MS	F	17	R	GT3	T	3	1	at_home
## 637	637	MS	M	18	U	GT3	T	4	4	teacher
## 638	638	MS	M	18	R	GT3	T	2	1	other
## 639	639	MS	M	17	U		T	2	3	other
## 640	640	MS	M	19	R	GT3	T	1	1	other

## 641	641	MS	M	18	R	GT3	T	4	2	other
## 642	642	MS	F	18	R	GT3	T	2	2	at_home
## 643	643	MS	F	17	U	GT3	T	4	3	teacher
## 644	644	MS	F	18	R	GT3	T	4	4	teacher
## 645	645	MS	F	19	R		T	2	3	services
## 646	646	MS	F	18	U	LE3	T	3	1	teacher
## 647	647	MS	F	18		GT3	T	1	1	other
## 648	648	MS	M	NA	U		T	3	1	services
## 649	649	MS	M	18	R	LE3		3	2	services
##	Fjob	reason	guardian	traveltime	studytime	failures	schoolsup	famsup		
## 1	teacher	course	mother	2	2	0	yes	no		
## 2	other	course	father	1	2	0	no	yes		
## 3	other	other	mother	1	2	0	yes	no		
## 4	services	home	mother	1	3	0	no	yes		
## 5	other	home	father	1	2	0	no	yes		
## 6		reputation	mother	1	2	0	no	yes		
## 7	other	home	mother	1	2	0	no	no		
## 8	teacher	home	mother	2	2	0	yes	yes		
## 9	other	home	mother	1	2	0	no	yes		
## 10	other	home	mother	1	2	0	no	yes		
## 11	health	reputation	mother	1	2	0	no	yes		
## 12	other	reputation	father	3	3	0	no	yes		
## 13	services	course	father	1	1	0	no	yes		
## 14	other	course	mother	2	2	0	no	yes		
## 15	other	home	other	1	3	0	no	yes		
## 16	other	home	mother	1	1	0	no	yes		
## 17		reputation		1	3	0	no	yes		
## 18	other	reputation	mother	3	2	0	yes	yes		
## 19	services	course	mother	1	1	3	no	yes		
## 20	other	home	father	1	1	0	no	no		
## 21	other	reputation	mother	1	2	0	no	no		
## 22	health	other	father	1	1	0	no	yes		
## 23	other	course	mother	1	2	0	no	no		
## 24	other		mother	2	2	0	no	yes		
## 25	health	course	mother	1	3	0	yes	yes		
## 26	services	home	mother	1	1	0	no	yes		
## 27	other	home	mother	1	1	0	no	yes		
## 28	services	other	mother	1	1	0	no	no		
## 29	other	home	mother	1	2	0	yes	yes		
## 30		home	mother	1	2	0	no	yes		
## 31	services	home	mother	1	2	0	no	yes		
## 32	services	reputation	mother	2	2	0	no	yes		
## 33	at_home	course	mother	1	2	0	no	yes		
## 34	other	course	mother	1	2	0	no	no		
## 35	other	home	mother	1	1	0	no	yes		
## 36	other	other	father	2	1	0	no	yes		
## 37	services	home	mother	1	NA	0	no	yes		
## 38	teacher	reputation	mother	2	3	0	no	yes		
## 39	health	course	mother	1	3	0	yes	yes		
## 40	other	reputation	mother	1	1	0	yes	yes		
## 41	other	home	mother	2	2	0	no	yes		
## 42	other	home	other	1	1	0	no			
## 43	teacher	course		1	2	0	no	yes		
## 44	services	course	father	1	1	0	yes	yes		

## 45	at_home	course		2	2	1	yes	no
## 46	other	course	mother	1	2	0	yes	yes
## 47	services	home	mother	1	2	0	no	yes
## 48	services	reputation	mother	1	4	NA	no	no
## 49	other	home	mother	1	2	0		yes
## 50	teacher	other	father	1	2	0	yes	yes
## 51	services	course	mother	3	2	0	no	yes
## 52	other	other	mother	1	2	0	no	yes
## 53	health	other		2	1	0	no	no
## 54	services	course	mother	1	1	0	yes	yes
## 55	other	other	mother	1	1	0	no	no
## 56	other	other	mother	1	2	0	no	no
## 57	services		mother	1	2	0	no	yes
## 58	health	reputation		1	NA	0	no	yes
## 59	at_home	home	father	1	2	0	yes	
## 60	other	course	mother	1	2	0	no	yes
## 61	teacher	other	mother	1	NA	0	no	yes
## 62	services	course	father	4	1	0	yes	yes
## 63	services	reputation	father	1	2	0	yes	no
## 64	health	home	mother	1	3	0	yes	
## 65	services	reputation	father	1	2	0	yes	no
## 66	services	course	mother	3	2	0	no	yes
## 67	services	reputation	mother	1	4	0	no	yes
## 68	other	course	mother	1	4	0	yes	yes
## 69	services	reputation	mother	2	2	0	yes	yes
## 70	other	reputation	father	2	4	0	no	yes
## 71	other	reputation	father	2	4	0	no	yes
## 72	other	course	mother	1	4	0	no	no
## 73	other	reputation	mother	1	2	0	yes	yes
## 74	other	reputation	mother	1	1	0	no	no
## 75	services	home	mother	1	2	0	yes	yes
## 76	other	home	mother	1	2	0	no	yes
## 77	other	course	mother	2	4	0	no	no
## 78	other	reputation	mother	1	4	0	no	no
## 79	other	home	mother	2	NA	3	yes	yes
## 80	other	course	mother	1	2	0	no	yes
## 81	services	course	father	1	1	0	yes	yes
## 82	other	home	mother	1	3	0	yes	no
## 83	other		mother	1	2	0	no	yes
## 84	services	home	mother	2	2	0	no	no
## 85	other	home	father	1	2	0		yes
## 86	services	reputation	father	2	2	0	no	no
## 87	other	course		1	2	0		yes
## 88	other	reputation	mother	1	3	0	no	yes
## 89	other	reputation	father	2	2	0	no	no
## 90	health	reputation	mother	1	2	0	no	yes
## 91	other	home	mother	1	3	0	no	yes
## 92	other	reputation	mother	1	1	0	no	no
## 93	other	home	father	1	2	0	yes	
## 94	services	home	mother	NA	2	0	no	yes
## 95	health	reputation		1	4	0	no	yes
## 96	other	home	mother	2	4	0	yes	yes
## 97		reputation	mother	2	1	0	yes	yes
## 98	other	course	mother	1	2	0	no	yes

## 99	other	reputation	mother	1	NA	0		no
## 100	at_home	course	mother	1	3	0	yes	yes
## 101	services	other	mother	1	1	0	yes	yes
## 102	teacher	other		1	3	0	no	yes
## 103	other	course	mother	1	1	0	no	yes
## 104	other	home	mother	2	2	0	yes	yes
## 105	other	course		1	2	0	no	yes
## 106	health	reputation		1	4	0	yes	
## 107	other	course	mother	1	4	0	yes	yes
## 108	other	home	father	NA	3	0	no	yes
## 109	other	home	father	4	4	NA	no	yes
## 110	health	other	mother	1	NA	0	no	yes
## 111	teacher	course	mother	1	1	0	no	no
## 112	other	reputation	father	1	3	0	yes	yes
## 113	other	home	mother	1	2	1		no
## 114	other	course	mother	1	1	0	no	no
## 115	services	reputation	mother	1	NA	0	no	no
## 116	teacher	course		1	2	0	no	yes
## 117	teacher	reputation	father	2	2	0	no	yes
## 118	services	home	father	2	1	0	no	no
## 119	other	course	father	3	2	1	no	yes
## 120	other	reputation	father	1	1	0	no	no
## 121	services	course	mother	1	2	0	no	no
## 122	services	home	father	1	4	0	no	yes
## 123	health	course	father	2	2	0	no	yes
## 124	other	course	mother	1	1	0	no	yes
## 125	other	home		1	2	0	no	no
## 126	services	home	father	1	1	0		no
## 127	other	home	mother	1	2	0	yes	no
## 128	other	course	other	1	2	2	no	yes
## 129	teacher	course		1	1	0	no	
## 130	other	course	mother	2	3	0	no	yes
## 131	teacher	course	father	2	3	0	no	yes
## 132	other	reputation	mother	1	2	3	no	yes
## 133	other	course	mother	3	1	0	no	yes
## 134	other	course	mother	3	1	0	no	yes
## 135	other	course	father	1	1	0	no	yes
## 136	other	course	father	1	1	0	no	no
## 137	other	course	mother	4	1	0	no	no
## 138	other	home	mother	1	1	1	no	no
## 139	teacher	course		4	2	0	no	yes
## 140	at_home	course	mother	1	3	0	no	yes
## 141	other	course	mother	3	2	0	no	no
## 142	other	course	mother	4	2	0	no	yes
## 143	services	course	mother	2	1	0	no	no
## 144	services	course	other	1	3	0	no	
## 145	services	reputation	mother	2	1	0	no	yes
## 146	other	course	other	2	1	0	no	yes
## 147	other	course	mother	1	2	2	no	no
## 148	teacher	course	mother	2	1	0	no	no
## 149	other	course	mother	3	1	1	no	no
## 150	services	course	father	2	4	0	yes	yes
## 151	services	home	mother	1	NA	0	no	no
## 152	services	course	mother	1	3	NA	no	yes

## 153	services	reputation	father	2	1	0	no	yes
## 154	services	course	mother	1	3	0	no	yes
## 155	at_home	course	mother	1	1	0	no	no
## 156	other	home	mother	1	1	0	no	yes
## 157	services	course	father	1	2	0	no	yes
## 158	other	home	mother	2	1	0	no	yes
## 159	services	home	father	1	2	1	no	yes
## 160	other	course	mother	1	NA	0	no	yes
## 161	services	course		1	2	0	no	no
## 162	teacher	course	mother	1	1	0	no	yes
## 163	other	course	mother	4	1	0	no	no
## 164	other	course	mother	1	1	2	no	no
## 165	other	course	mother	1	1	1	no	no
## 166	services	reputation	other	2	3	0	no	yes
## 167	at_home	home	mother	1	1	0	no	yes
## 168	teacher	course	mother	1	1	0	yes	yes
## 169	services	course	mother	1	2	0	yes	no
## 170	other	reputation	mother	1	1	3	no	no
## 171	other	course	mother	3	1	NA	no	yes
## 172	other	course	mother	3	1	0	no	no
## 173	services	course	father	1	2	1	no	yes
## 174	services	course	mother	2	1	2	no	no
## 175	other	course	mother	2	1	1	no	no
## 176	other	course	mother	2	2	2	yes	yes
## 177	other	course	mother	2	1	0		no
## 178	services	course		1	1	1	no	no
## 179	services	course	mother	4	2	0	no	no
## 180	services	course	mother	2	1	3	no	yes
## 181	other	course	father	1	2	0	no	no
## 182	services	home	father	1	2	0		no
## 183	other	home	mother	1	2	0	no	yes
## 184	health	reputation	mother	NA	2	0	no	yes
## 185	other	course	father	3	1	1	no	yes
## 186	other	reputation	mother	2	2	0	no	yes
## 187	other	reputation	mother	1	2	0	no	yes
## 188	services	home	mother	1	2	0	no	no
## 189	other	reputation	mother	2	2	0	no	yes
## 190	other	course	mother	2	NA	0	no	no
## 191	other	reputation	mother	2	2	0	no	no
## 192	other	reputation	father	1	2	0	no	no
## 193	services	other	mother	1	1	0	no	yes
## 194	other	course	mother	1	2	0	no	yes
## 195	other	home	mother	1	2	0	no	
## 196	other	home	mother	1	2	0	no	no
## 197	services	reputation	father	1	2	0	no	yes
## 198	other	reputation	mother	1	2	0	no	yes
## 199	other	reputation	mother	NA	2	0	no	yes
## 200	services	other	mother	1	2	0	no	yes
## 201	services	other	mother	1	1	0	no	yes
## 202	other	course	mother	1	2	0	no	no
## 203	other	reputation	mother	1	2	0	no	yes
## 204	other	home	mother	1	2	0	no	no
## 205	services	course	mother	1	2	0	no	no
## 206	services	course		1	2	0	no	no

## 207	services	other	other	2	2	0	no	no
## 208	services	reputation	mother	1	1	0	no	yes
## 209	other	home		2	1	0	no	no
## 210	services	course	father	1	2	0	no	no
## 211	teacher	home	mother	1	1	0	no	no
## 212	other	home	father	3	1	0	no	yes
## 213	teacher	home	mother	2	1	1	no	yes
## 214	teacher	reputation	mother	1	2	0	no	yes
## 215	other	home	mother	1	2	0	no	
## 216	other	reputation	mother	1	2	0	yes	yes
## 217	other	course	mother	1	2	0	no	yes
## 218	other	reputation	mother	1	NA	0	no	yes
## 219	services	reputation		2	4	0	no	yes
## 220	services	home	mother	1	3	1	no	yes
## 221	other	course	mother	1	2	0	no	
## 222	other	other	mother	1	2	0	no	no
## 223	other	home	mother	2	1	0	no	
## 224	other	reputation	mother	2	3	0	no	yes
## 225	other	reputation	other	1	4	NA	no	
## 226	other	home	mother	1	2	0	no	yes
## 227	other	reputation	mother	1	2	0	yes	yes
## 228	other	home		1	2	0	no	yes
## 229	other	other	mother	1	1	0	no	yes
## 230	other	reputation	mother	2	2	0	no	no
## 231	other	reputation	mother	1	2	0	no	no
## 232	health	home	father	1	2	0	no	yes
## 233	other	home	father	2	1	0	no	yes
## 234	at_home	course	mother	1	3	0	no	yes
## 235	services	reputation	mother	2	2	0	no	yes
## 236	other	reputation	mother	1	3	0	no	yes
## 237	teacher	other	mother	1	2	0	yes	no
## 238	other	home	mother	2	2	3	no	yes
## 239	services	home	mother	1	3	0	no	yes
## 240	other	reputation	mother	1	2	0		no
## 241	other	course	mother	1	2	0	no	no
## 242	services	reputation	father	1	2	0	no	yes
## 243	other	course	mother	4	2	0	yes	yes
## 244	other	course	mother	2	3	0	no	no
## 245	other	reputation	father	1	2	0	no	no
## 246	other	course	father	2	2	NA	no	yes
## 247	teacher	reputation	mother	1	2	0	yes	yes
## 248	other	reputation	father	1	2	0	no	yes
## 249	other	home	mother	2	2	0	no	yes
## 250	other	reputation	mother	2	3	0	no	no
## 251	other	home	father	1	2	0	no	no
## 252	other	home	mother	1	1	0	no	no
## 253		home	mother	1	2	0	no	no
## 254	other	course	mother	2	2	1	no	yes
## 255	services	course	mother	1	2	1	no	yes
## 256	other	course	mother	2	1	1	no	no
## 257	at_home	course	other	1	1	1	no	yes
## 258	teacher	course	mother	1	1	0	no	yes
## 259	other	course	father	1	2	0	no	no
## 260	at_home	course	mother	1	3	0	no	yes

## 261	other	course	mother	1	1	0	no	no
## 262	services	course	mother	3	2	0	no	no
## 263	other	course	other	4	1	1	no	yes
## 264	services	reputation	father	1	2	0	no	no
## 265	other	home	mother	1	1	1	no	yes
## 266	other	course		2	3	0	no	no
## 267	other	course	mother	1	2	0		yes
## 268	other	course	mother	2	2	0	no	no
## 269	other	course	mother	2	2	0	no	yes
## 270	other	course	mother	1	1	0	no	no
## 271	services	course	mother	1	1	0	no	no
## 272	services	course	mother	1	2	0	no	yes
## 273	other	home	father	2	3	0	no	no
## 274	other	home	mother	2	3	0	no	yes
## 275	other	course	mother	1	2	NA	yes	no
## 276	other	course	other	2	3	0	no	yes
## 277	other	course	mother	3	1	0	no	no
## 278	services	course	father	1	2	0	no	yes
## 279		course	father	2	1	0	no	no
## 280	services	other	mother	1	1	3	no	no
## 281	services	course	mother	1	2	0	no	yes
## 282	other	other	mother	1	1	0	no	no
## 283	other	course	mother	2	1	0	no	no
## 284	other	reputation	other	3	2	1	yes	yes
## 285	services	other	mother	1	1	2	no	no
## 286	other	course	mother	2	1	0	no	no
## 287	other	course	mother	1	1	0	no	no
## 288	other	course	mother	2	1	1	no	yes
## 289	other	course	mother	1	2	0	no	yes
## 290	services	reputation	mother	1	4	0	no	yes
## 291	services	home	mother	1	2	0	no	yes
## 292	other	course	mother	NA	2	1	no	no
## 293	other	course	mother	1	3	0	no	yes
## 294	at_home	home		1	3	NA	no	yes
## 295	other	home	mother	1	2	0	yes	no
## 296	at_home	reputation	mother	1	2	0	no	yes
## 297	other	home	mother	1	2	0	no	no
## 298	services	other	mother	2	1	0	no	no
## 299	services	course	father	1	4	0	no	no
## 300	other	course	other	2	NA	0	no	
## 301	other	home	father	1	2	0	no	yes
## 302	other	course	mother	1	2	0	no	yes
## 303	other	course	mother	1	3	0	no	no
## 304	other	home		1	3	0	no	no
## 305	services	home	mother	1	3	0	no	yes
## 306	other	home	father	2	1	0	no	no
## 307	other	reputation	mother	2	2	0	no	yes
## 308	other	other	mother	1	2	0	no	no
## 309	other	reputation	mother	2	2	0	no	no
## 310	other	reputation	father	1	2	0	no	
## 311	other	reputation	mother	2	2	0	no	yes
## 312	services	home	other	1	NA	0		yes
## 313		reputation	father	1	4	0	no	yes
## 314	other	home	mother	2	2	0	no	yes

## 315	at_home	home	mother	1	2	0	no	yes
## 316	other	home	mother	1	2	0	no	yes
## 317	health	reputation	mother	2	2	0		yes
## 318	other	course	mother	2	2	0	yes	yes
## 319	services	home	mother	NA	2	0	no	no
## 320	services	home		2	1	0	no	no
## 321	health	reputation	father	1	2	1	yes	yes
## 322	services	reputation	father	3	3	0	no	yes
## 323	services		father	1	2	1	yes	yes
## 324	services	course	mother	2	1	0	no	no
## 325	other	home	other	2	1	0	no	no
## 326	other	home	mother	2	1	0	no	no
## 327	services	home	mother	1	1	NA	no	
## 328	other	reputation	mother	2	4	0	no	yes
## 329	other	home	mother	2	2	0	yes	no
## 330	other	course	mother	1	2	0	no	yes
## 331	other	reputation	mother	2	2	0	no	no
## 332	other	reputation		1	2	0	no	no
## 333	at_home	other		1	3	0	no	yes
## 334	teacher	reputation		1	3	0	no	yes
## 335	services	reputation	mother	1	3	0	no	no
## 336	teacher	reputation	mother	1	2	0	no	yes
## 337	other	home	mother	1	2	0	no	yes
## 338	services	reputation	mother	1	3	0	no	yes
## 339	other	reputation	mother	2	NA	0	no	yes
## 340	other	reputation	mother	2	3	0	no	yes
## 341	other	home	mother	1	1	0	no	yes
## 342	other	reputation	other	2	2	0	no	yes
## 343	other	home	other	2	2	0	no	yes
## 344	other	reputation	father	1	4	0	no	yes
## 345	teacher	home	mother	1	1	0	no	yes
## 346	other	home	mother	1	2	0	no	yes
## 347	teacher	home	father	2	1	0	no	no
## 348	services	reputation	mother	2	NA	0	no	yes
## 349	other	reputation	mother	2	3	0	no	yes
## 350	health	reputation	father	1	4	0	no	yes
## 351	services	course	mother	2	3	1	no	no
## 352	other	course	other	1	1	2	no	no
## 353	services	reputation	father	1	2	0	no	no
## 354	teacher	home	mother	1	2	0	yes	yes
## 355	other	course	mother	2	2	0	no	yes
## 356	other	course		2	2	0	no	no
## 357	teacher	course	mother	1	1	0	no	no
## 358	other	course	mother	1	3	0	no	
## 359	services	course	mother	2	1	0	no	yes
## 360	services	course	father	1	3	0	no	yes
## 361	other	course	father	1	2	0	no	yes
## 362	other	course	mother	2	2	0	no	yes
## 363	other	course	mother	1	2	0	no	yes
## 364	other	course	mother	1	1	0	no	yes
## 365	health	course	mother	1	1	0	no	no
## 366	services	course		1	2	0	no	yes
## 367	other	home	mother	1	2	0	yes	yes
## 368	other	home	father	1	NA	0	no	no

## 369	other	reputation	father	1	1	0	no	yes
## 370	other	course	other	3	3	0	no	no
## 371	other	course	other	3	2	2	no	yes
## 372	other	course	mother	1	1	0	no	yes
## 373	other	course	mother	1	2	0	no	yes
## 374	services	course		1	3	0	no	yes
## 375	services	course	father	1	3	0	no	yes
## 376	at_home	home	father	2	3	0	no	no
## 377	other	home	mother	2	3	0	no	no
## 378	other	course	mother	1	3	0	no	no
## 379	services	reputation	mother	1	1	0	no	no
## 380	other	course	mother	4	1	NA	no	yes
## 381	services	course	mother	1	3	0	no	yes
## 382	teacher	course	mother	2	NA	0	no	yes
## 383	other	course	mother	1	1	0	no	yes
## 384	other	course	mother	1	4	0		yes
## 385	services	home	other	1	1	0	no	yes
## 386	other	course	mother	4	2	0	no	no
## 387	other	course		1	3	0	no	yes
## 388	other	reputation	mother	1	1	0	no	no
## 389	services	home	mother	1	2	0	no	no
## 390	other	home	other	1	2	0	no	no
## 391	other	course	mother	2	NA	0	no	no
## 392	other	course	mother	1	3	0	no	
## 393	other	home	mother	1	2	0	no	yes
## 394	services	home	mother	1	4	0	no	
## 395	other	home	mother	1	2	NA	no	yes
## 396	services	home	father	1	2	0	no	yes
## 397	other	home	mother	1	2	0	no	no
## 398	at_home	home	father	1	2	0	no	yes
## 399	other	course	mother	1	3	0	no	yes
## 400	services	other	mother	1	3	0	no	no
## 401	services	course	mother	1	3	0	no	no
## 402	other	course	mother	1	3	0	no	yes
## 403	other	reputation	mother	1	3	NA	no	yes
## 404	other	course	mother	2	2	0	no	yes
## 405	other	reputation	mother	1	2	0	no	yes
## 406	other	home	other	2	1	1	no	no
## 407	at_home	home	mother	1	1	1	no	yes
## 408	other	reputation	other	1	3	2	no	no
## 409	services	reputation	mother	1	2	0	no	yes
## 410	other	reputation	other	1	2	0	no	no
## 411	services	reputation	mother	1	2	0	no	yes
## 412	other	reputation	mother	1	3	0	no	yes
## 413		course	mother	1	2	0	no	yes
## 414	other	course	other	2	2	2	no	yes
## 415	other	reputation	other	2	3	0	no	no
## 416	other	home	other	1	1	1	no	yes
## 417	other	reputation	mother	1	2	0	no	yes
## 418	other	reputation		1	3	0	no	yes
## 419	services	reputation	father	1	1	0	no	no
## 420	other	reputation	mother	NA	1	0	no	no
## 421	other	reputation	mother	2	2	0	no	yes
## 422	other	reputation	mother	2	1	1	yes	no

## 423	other	home	mother	1	2	0	no	yes
## 424	other	other	father	2	1	0	no	yes
## 425	other	course	mother	2	2	0	no	yes
## 426	services	other	mother	1	1	1	no	yes
## 427	other	course	mother	2	1	0	no	yes
## 428	services	course	mother	2	2	0	no	no
## 429	other	home	mother	2	1	0		no
## 430	other	home	mother	1	2	0	no	yes
## 431	other	other	mother	1	3	0	yes	
## 432	other	course	father	1	2	1	no	no
## 433	other	other	father	1	1	1	no	yes
## 434	other	course	mother	2	1	0	no	no
## 435	other	reputation	mother	2	4	0	no	no
## 436	services	reputation	father	2	2	0	no	yes
## 437	services	course	mother	2	1	1	no	yes
## 438	other	other	mother	2	1	0	no	yes
## 439	other	course	mother	2	1	NA	no	yes
## 440	services	course	father	2	1	0	no	no
## 441	services	home		2	2	0	no	yes
## 442	other	home	mother	1	2	0	no	no
## 443	services	reputation	father	1	2	0	no	yes
## 444	services	reputation	father	1	2	0	no	yes
## 445	health	other	mother	3	2	0	no	no
## 446	other	course	mother	4	2	0	no	yes
## 447	at_home	reputation	father	1	2	0	no	yes
## 448	other	other	mother	3	1	0	no	no
## 449	teacher	course		2	3	0	no	no
## 450	services	course	mother	2	1	0	no	no
## 451	services	course	mother	3	2	0	no	yes
## 452	other	course	father	2	2	0	no	no
## 453	other	course	mother	3	2	0	no	yes
## 454	services	course	mother	1	3	1	no	yes
## 455	services	course	mother	1	3	1	no	yes
## 456	other	home	mother	1	2	0	yes	yes
## 457	other	course		1	2	0	no	yes
## 458	services	reputation	mother	1	1	0	no	yes
## 459	other	home	father	4	4	0	no	yes
## 460	other	other	father	4	3	0	yes	yes
## 461	other	home	father	2	2	0	no	yes
## 462	other	other	mother	2	1	0	no	no
## 463	at_home	course	father	3	2	0	no	yes
## 464	other	other	father	1	3	0	yes	yes
## 465	other	other	father	2	1	0	no	no
## 466	other	course	father	NA	2	1	no	yes
## 467	services	home	mother	2	1	0	no	yes
## 468	services	course	father	3	2	0	no	yes
## 469	other	reputation	mother	3	1	0	no	no
## 470	teacher	course	father	1	2	0	no	yes
## 471	other	reputation	mother	1	2	0	no	yes
## 472	other	course	mother	2	2	1	no	yes
## 473	other	home	father	3	1	0	no	
## 474	services	course	mother	2	1	0	no	yes
## 475		reputation	father	3	1	0	no	yes
## 476	services	course	mother	2	3	0	no	yes

## 477	other	home	mother	1	1	0	no	yes
## 478	services	course	father	NA	1	0	no	yes
## 479	other	course	father	2	NA	3	yes	yes
## 480	at_home	course	mother	1	1	0	no	yes
## 481	services	course	other	1	NA	1	no	no
## 482	other	course	mother	3	1	0	no	yes
## 483	other	course	mother	2	1	0	no	yes
## 484	other	course	father	3	2	0	no	yes
## 485	other	home	mother	1	1	0	no	yes
## 486	other	course	mother	2	2	0	no	yes
## 487	services	course	father	1	1	1	no	yes
## 488	other	course	other	2	3	2	no	yes
## 489	services	course	mother	1	3	1	no	no
## 490	other	home	mother	2	1	1	no	no
## 491	at_home	course		2	1	1		
## 492	other	course	other	2	2	1	no	yes
## 493	other	course	mother	1	2	0	no	no
## 494	at_home	course	father	2	1	0	no	no
## 495	other	course	mother	1	2	0		
## 496	other	reputation	mother	1	1	0	no	no
## 497	services	home	mother	1	1	0	no	yes
## 498	at_home	course	mother	2	4	1	no	yes
## 499	services	course	mother	1	2	NA	no	yes
## 500	other	course	mother	1	1	0	no	yes
## 501	other	course	father	1	1	1	no	yes
## 502	other	course	father	1	1	0	no	no
## 503	services	other		3	4	1	no	yes
## 504	other	course	other	1	4	NA	yes	yes
## 505	other	home	mother	1	3	0	no	no
## 506	other	reputation	mother	2	1	0	no	yes
## 507	services	other	mother	2	2	1	no	no
## 508	services	course	father	1	3	0	no	yes
## 509	other	course	mother	3	1	1	no	yes
## 510	other	course		3	2	0	no	yes
## 511	other	reputation	mother	2	2	0	no	yes
## 512	other	other		2	2	0	no	no
## 513	other	other	mother	1	2	1	no	yes
## 514	other	course	mother	1	1	0	no	no
## 515	at_home	course	mother	1	1	0	no	no
## 516	at_home	reputation	mother	2	2	0	yes	no
## 517	teacher	reputation		1	2	0	no	no
## 518	other	reputation	mother	2	1	0	no	no
## 519	services	reputation	father	1	2	1	no	yes
## 520	services	reputation	mother	2	NA	0	no	no
## 521	other	other	mother	3	2	0	no	yes
## 522	services	other	mother	2	2	0	no	yes
## 523	health	course	mother	1	NA	0	no	yes
## 524	health	home	mother	1	4	0	no	yes
## 525	other	other	mother	3	2	0	no	yes
## 526	services	home	mother	1	3	0	no	yes
## 527	other	other	mother	1	1	0	no	no
## 528	services	other	mother	4	3	0	no	no
## 529	other	other	mother	1	1	0	no	yes
## 530	services	other	father	2	1	NA	no	yes

## 531	services	home	mother	1	1	0	no	yes
## 532	services	other	mother	3	2	0	no	no
## 533	services	other		2	2	0	no	no
## 534	services	other	mother	1	2	0	no	no
## 535	health	other		1	1	0	no	yes
## 536	services	course	mother	3	2	0	no	yes
## 537	other	reputation	mother	3	4	0	no	yes
## 538	services		mother	1	1	0	no	no
## 539	other	course	mother	1	3	0	no	yes
## 540	other	home	mother	2	2	0	no	yes
## 541	other	home	mother	2	1	0	no	no
## 542	other	other	mother	2	2	0	yes	no
## 543	services	course	mother	2	3	0	no	yes
## 544	other	course		3	1	3	no	no
## 545	other	course	father	2	1	0	no	no
## 546	other	other	mother	1	NA	1	no	yes
## 547	health	course	father	1	2	0	no	yes
## 548		other	father	1	1	NA	no	no
## 549	at_home	other	mother	1	2	0	no	no
## 550	other	course	mother	2	2	0	yes	yes
## 551		course	father	2	2	0		yes
## 552	other	other	father	2	2	0	no	yes
## 553	other	other	mother	1	2	2	no	yes
## 554	other	home	mother	1	1	0	no	no
## 555	at_home	course	father	NA	1	0	no	yes
## 556	other	home	father	1	3	0	yes	yes
## 557	at_home	course	mother	1	1	0	no	no
## 558	other	course	mother	2	2	3	no	yes
## 559	other	course	mother	2	1	0	no	no
## 560	at_home	course	other	3	1	1	yes	yes
## 561	services	course	mother	2	1	0	no	yes
## 562	at_home	course	mother	2	2	0		yes
## 563	services		father	1	2	0	no	no
## 564	other	course	mother	1	1	1	no	no
## 565	other	course	father	2	1	0	no	no
## 566		course	mother	2	1	0	no	no
## 567	other	course		2	1	1	no	yes
## 568	other	course	mother	1	1	1	no	no
## 569	services	course	mother	2	1	3	no	no
## 570	at_home	course	mother	1	2	2	no	yes
## 571	services	course	mother	2	1	0	no	yes
## 572	other	course	other	2	1	3	no	no
## 573	at_home	course	mother	2	2	2	no	yes
## 574	at_home	course	mother	1	1	0	no	yes
## 575	other	course	other	2	1	1	no	yes
## 576	services	course	mother	1	1	0	no	yes
## 577	other	course	mother	2	1	0	no	
## 578	services	home	other	3	2	1	no	no
## 579	other	course	mother	2	2	1	no	yes
## 580	services	course	mother	1	1	0	no	no
## 581		home	other	3	NA	1	no	yes
## 582	other	course	mother	2	2	2	no	yes
## 583	other	course	mother	1	1	0	no	yes
## 584	other	other	mother	2	1	1	no	no

## 585	other	course	mother	2	1	0	no	yes
## 586	at_home	course	other	2	3	0	no	yes
## 587	services	home	mother	1	2	0	yes	yes
## 588	services	course	mother	1	2	1	no	yes
## 589	at_home	course	mother	1	1	0	no	
## 590	other	course	father	1	1	0	no	no
## 591	other	course	mother	3	2	2	no	no
## 592	at_home	reputation	father	2	2	0	no	no
## 593	services	course	mother	2	1	0	no	yes
## 594	other	reputation	mother	2	2	0	no	no
## 595	teacher	reputation	mother	2	2	0	no	no
## 596	other	reputation		1	1	0		yes
## 597	other	course	mother	2	2	0	no	yes
## 598	other	course	mother	3	2	1	no	no
## 599	services	home	mother	NA	1	0	no	yes
## 600	services	other	mother	3	1	0	no	yes
## 601	services	other		3	1	0	no	no
## 602	other	course	mother	2	2	0	no	yes
## 603	services	course	father	2	3	NA	no	no
## 604	other	reputation	mother	1	2	0	no	no
## 605	services	course	mother	3	2	1	no	no
## 606	services	other	father	2	NA	1	no	no
## 607	other	course	father	2	4	0	no	no
## 608	other	reputation	mother	2	2	0	no	no
## 609	services	course	mother	1	2	0	no	no
## 610	at_home	course	father	2	2	0	no	yes
## 611	at_home	course	other	NA	2	3	no	yes
## 612	other	home	mother	2	3	0	no	no
## 613	other	home	mother	2	2	1	no	yes
## 614	services	course	father	1	2	0	no	yes
## 615	services	other	father	2	2	0	no	yes
## 616	other	reputation	mother	2	2	0	no	no
## 617	services	home	father	2	1	0	no	no
## 618	services	course	father	2	3	0	no	no
## 619	other	course	mother	3	2	0	no	no
## 620	services	other	mother	2	2	0	no	yes
## 621	at_home	course	mother	1	2	0	no	yes
## 622	services	course	father	2	2	0	no	no
## 623	other	course	mother	2	2	0	no	yes
## 624	services	other	mother	2	3	0	no	no
## 625	services	reputation		3	1	1	no	yes
## 626	services	course	father	2	1	0	no	yes
## 627	teacher	other	father	3	NA	0	no	yes
## 628	services	other	father	3	1	0	no	yes
## 629	at_home	home	mother	1	3	0	no	no
## 630	other	course	mother	1	1	0	no	no
## 631	other	reputation		2	3	0	no	no
## 632	other	home		4	3	0	no	no
## 633	other	course	other	2	2	1	no	yes
## 634	services	course	mother	NA	2	0	no	no
## 635	other	home		1	2	0	no	no
## 636	other	reputation		1	2	NA	no	yes
## 637	teacher	home	father	1	2	0	no	no
## 638	other	other	mother	2	1	0	no	no

## 639	services	home	father	2	2	0	no	no		
## 640	services	other	mother	2	1	1	no	no		
## 641	other	home	father	2	1	1	no	no		
## 642	other	other	mother	2	3	0	no			
## 643	other	other	mother	2	2	0	no	no		
## 644	at_home	reputation	mother	3	1	0	no	yes		
## 645	other	course	mother	1	3	1	no	no		
## 646	services	course	mother	1	2	0	no			
## 647	other	course		2	2	0	no	no		
## 648	services	course	mother	2	1	0	no	no		
## 649	other	course	mother	3	1	0	no	no		
##	paid activities	nursery	higher	internet	romantic	famrel	freetime	goout	Dalc	
## 1	no	no	yes	yes	no	no	4	3	4	1
## 2	no	no	no	yes	yes	no	5	3	3	1
## 3	no	no	yes	yes	yes	no	4	NA	2	2
## 4	no	yes	yes	yes	yes	yes	3	2	2	1
## 5	no	no	yes	yes	no	no	4	3	2	1
## 6	no	yes	yes	yes	yes	no	5	4	2	1
## 7	no	no	yes	yes	yes	no	4	4	4	1
## 8	no	no	yes	yes	no	no	4	1	4	1
## 9	no	no	yes	yes	yes	no	4	2	2	1
## 10	no	yes	yes	yes		no	5	5	1	1
## 11	no	no	yes	yes	yes	no	3	3	3	1
## 12	no	yes	yes	yes	yes	no	5	2	2	1
## 13	no	yes	yes	yes	yes		4	3	3	1
## 14	no	no	yes	yes	yes	no	5	4	3	1
## 15	no	no	yes	yes	yes	yes	4	5	2	NA
## 16	no	no	yes	yes	yes		4	4	4	1
## 17	no	yes	yes	yes	yes	no	3	2	3	1
## 18	no	yes	yes	yes	no	no	5	3	NA	1
## 19	yes	yes	yes	yes	yes	no	5	5	5	2
## 20	no	yes	yes		yes		3	1	3	1
## 21	no	no	yes	yes	yes	no	4	4	1	1
## 22	yes	no	yes	yes	yes	no	5	4	NA	1
## 23	no	yes	yes	yes	yes	no	4	5	1	1
## 24	no	yes	yes	yes	yes	no	5	4	4	2
## 25	no	yes	yes	yes	yes	no	4	3	2	1
## 26	no	no	no	yes	yes	no	NA	2	2	1
## 27	no	no	yes	yes	yes	no	4	2	2	1
## 28	no	no	yes	yes	yes	no	2	2	4	2
## 29	yes	yes	yes	yes	yes	no	NA	3	3	1
## 30	yes	yes	yes	yes	yes	yes	4	4	5	5
## 31	yes	no	no	yes	yes	no	5	4	2	3
## 32	no	yes	yes	yes	yes	no	4	3	1	1
## 33	no	yes	yes	yes		yes	4	5	2	1
## 34	no	yes	no	yes	yes	no	5	3	2	1
## 35	no	no	no		yes		5	4	3	1
## 36	no	yes	yes	yes	no	no	3	5	1	1
## 37	no	yes	yes	yes	yes	no	5	4	3	1
## 38	no	yes	yes	yes	yes	yes	2	4	3	1
## 39	no	yes	yes			no	4	3	2	1
## 40	no	yes	yes	yes	no	no	4	3	1	1
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## 42	no	no	no		yes	yes	5	4	3	2

## 43	no	yes	yes	yes		no	4	3	3	1
## 44	no	no	yes	yes	yes	no	NA	4	1	1
## 45	no	yes	yes	yes	yes	no	4	3	3	2
## 46		yes	yes	yes	yes	yes	5	2	2	1
## 47	no	no	yes	yes	yes	no	2	3	5	1
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## 49	no	no	yes	yes	no	no	4	3	NA	2
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## 54	no	no	yes	yes	yes	no	3	3	4	2
## 55	no	no	yes	yes	yes	no	5	3	4	4
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## 57	no	yes	yes	yes	yes	no	4	3	2	1
## 58	no	yes	yes	yes	no		3	2	2	1
## 59	no	yes	yes	yes	yes	no	4	3	2	1
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## 61	no	yes	yes	yes	no	no	2	4	4	2
## 62	no	yes	no	yes	yes	yes	5	5	5	5
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## 65	no	yes	yes	yes	yes	yes	4	4	4	2
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## 68	no	no	yes	yes	yes		4	3	3	1
## 69	no	no	yes	yes	yes	no	4	1	3	1
## 70	no			yes	yes	no	4	4	2	2
## 71	no	no	yes	yes		no	4	3	2	1
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## 74	no	yes	yes	yes	no	no	5	3	2	2
## 75	no	yes	yes	yes	yes	no	4	NA	3	2
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## 77	no	yes	yes	yes	yes		3	4	3	1
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## 80	no	no	yes	yes	yes	no	2	4	3	1
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## 86	no	no	yes	yes	yes	yes	4	4	4	2
## 87	no	no	yes	yes	no	no	4	3	4	1
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## 90	no	no	yes	yes	no	no	4	1	3	3
## 91	no	no	yes	yes	yes	yes	4	3	3	1
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## 93	no	no	yes	yes	no	no	3	3	3	2
## 94	no	yes	yes	yes	yes	no	5	3	3	1
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## 96	yes	yes	yes	yes	yes	no	NA	1	2	1

## 97	yes	yes	no	yes	yes		3	3	3	1
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## 99	no	yes	no	yes	yes		5	3	4	1
## 100	no	no	yes	yes	yes	no	5	3	5	1
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## 103	yes	yes	no	yes	yes	no	5	3	3	1
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## 144	no	yes	no	yes	yes	yes	4	3	3	5
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## 147	no	no	yes		no	yes	4	4	4	1
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## 149	no	yes	yes	yes	yes	yes	5	5	5	1
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## 167	no	no	yes	no		yes	4	5	4	1
## 168	no	no	yes	yes	no	yes	4	2	1	1
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## 171	no	yes	no	yes		no	5	2	5	1
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## 173	no	no	yes	yes	yes	yes	4	NA	5	NA
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## 175	yes	yes	yes	no	yes	yes	3	3	2	2
## 176	no	no	yes	yes	yes	yes	4	4	4	1
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## 181	no	no	yes	no	yes	no	4	3	5	2
## 182	no	no	yes	yes	yes	yes	4	2	3	1
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## 184	no	no	yes	yes	yes	yes	4	4	2	1
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## 186	no	yes	yes	yes	yes	yes	4	3	2	1
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## 188	no	yes	no		yes	yes	4	3	5	1
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## 193	no	yes	yes	yes	yes		4	3	3	3
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## 198	no	yes	yes	yes	yes	yes	5	3	3	2
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## 202	no	yes	yes	yes	yes	yes	4	2	3	1
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##	245	no	yes	yes	yes	yes		3	2	3	1
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##	248	no	yes	yes	yes	yes	no	4	2	4	2
##	249	no	no	yes	yes	yes	no	3	4	2	1
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##	256	no	no	yes			no	4	1	1	NA
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## 259	no	yes	yes	yes	no	no	5	4	2	1
## 260	no	yes	yes	yes	yes	yes	4	3	2	1
## 261	no	no	yes	no		no	5	3	5	1
## 262	no	yes	yes	yes	no	no	2	1	1	1
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## 265	no	no	no	no	yes	no	3	1	2	1
## 266	no	yes	yes	yes	yes	no	4	3	3	NA
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## 269	no	no	yes	yes	yes		3	3	3	2
## 270	no	yes	no	yes	yes	no	5	4	5	1
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## 280	no	no	no	no	yes	yes	5	4	5	NA
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## 283	no	no	yes	no	yes	no	4	4	5	2
## 284	no	no	no	yes		no	5	3	3	1
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## 286	no	yes		yes	no	no	3	3	2	1
## 287	no	no	no	yes	yes	no	4	NA	2	NA
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## 302	no	no	no	yes		no	4	NA	2	NA
## 303	no	yes	no	yes	no	no	5	3	2	1
## 304	no	yes	no	yes	no	no	3	2	3	1
## 305	no	yes	yes	yes	yes	yes	4	3	3	1
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## 307	no	yes	yes	yes	yes	no	4	2	5	3
## 308	no	yes	yes	yes	yes	yes	5	4	4	3
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## 310	no	yes	yes	yes	yes		5	4	5	1
## 311	no	no	yes	no	yes	yes	4	3	5	1
## 312	no	yes	yes	yes	yes	no	4	3	5	3

## 313	no	yes	yes	yes	yes	yes	4	NA	5	1
## 314	no	no	no	yes	no	no	4	4	3	1
## 315	no	yes	no	yes	no	yes	3	NA	NA	2
## 316	no		yes	yes	yes	yes	4	2	5	1
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## 319	no	no	no	no	yes	yes	4	1	1	NA
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## 321	no	yes	yes		yes	yes	2	4	4	1
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##	Wal	alc	health	absences	G3					
## 1	1		3		4	11				
## 2	1		3		2	11				
## 3	3		3		6	12				
## 4	1		5		0	14				
## 5	2		5		0	13				
## 6	2		5		6	13				
## 7	1		3		0	13				
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## 9	NA		NA		0	17				
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## 11	2		2		2	14				
## 12	1		4		0	13				
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## 27	2		5		8	12				
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## 37	1		4		0	14				
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## 39	1		5		2	12				
## 40	1		2		8	12				

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## 42	4	5	8 11
## 43	NA	5	0 15
## 44	1	1	0 10
## 45	2	5	14 11
## 46	1	5	4 11
## 47	4	3	6 13
## 48	1	2	2 17
## 49	NA	5	4 13
## 50	1	NA	2 12
## 51	NA	4	0 13
## 52	1	5	0 16
## 53	4	5	4 9
## 54	3	5	0 12
## 55	4	1	0 13
## 56	1	2	2 12
## 57	1	1	0 15
## 58	1	5	8 16
## 59	1	5	0 14
## 60	NA	5	2 16
## 61	3	4	0 16
## 62	5	NA	0 16
## 63	1	1	0 10
## 64	4	NA	0 13
## 65	4	2	0 12
## 66	2	1	2 16
## 67	5	3	0 12
## 68	2	5	0 10
## 69	3	4	0 11
## 70	3	3	6 15
## 71	1	5	2 11
## 72	1	3	0 10
## 73	4	5	2 11
## 74	2	5	0 14
## 75	4	5	4 11
## 76	3	5	0 11
## 77	1	1	0 11
## 78	NA	3	1 13
## 79	1	3	0 10
## 80	2	3	14 11
## 81	3	NA	0 12
## 82	2	5	2 9
## 83	1	5	4 11
## 84	3	4	2 13
## 85	3	4	2 12
## 86	3	5	4 12
## 87	2	2	6 11
## 88	3	1	4 15
## 89	1	3	6 11
## 90	5	5	6 10
## 91	3	4	2 11
## 92	3	1	6 13
## 93	3	2	0 12
## 94	1	1	2 14

## 95	1	4	2 12
## 96	1	1	4 13
## 97	1	NA	6 11
## 98	1	5	0 12
## 99	2	1	4 13
## 100	1	3	2 13
## 101	5	4	12 8
## 102	1	4	0 16
## 103	1	5	2 12
## 104	1	2	16 10
## 105	1	1	0 16
## 106	1	4	10 10
## 107	1	3	4 10
## 108	1	5	4 14
## 109	5	1	8 11
## 110	1	4	2 14
## 111	1	4	4 14
## 112	1	2	4 11
## 113	1	5	12 10
## 114	1	3	10 18
## 115	1	5	4 10
## 116	2	5	6 14
## 117	NA	2	4 16
## 118	1	5	6 15
## 119	4	5	14 11
## 120	2	4	2 14
## 121	2	1	0 14
## 122	2	5	6 13
## 123	2	5	2 13
## 124	4	5	4 13
## 125	1	5	0 11
## 126	2	5	2 9
## 127	NA	1	0 11
## 128	1	5	0 11
## 129	5	4	8 15
## 130	2	1	4 13
## 131	2	5	0 12
## 132	3	NA	10 8
## 133	2	5	8 11
## 134	NA	NA	6 13
## 135	3	5	2 12
## 136	4	5	12 14
## 137	1	2	4 11
## 138	1	5	12 11
## 139	1	5	2 11
## 140	1	5	4 15
## 141	4	5	2 10
## 142	1	3	0 13
## 143	5	4	2 12
## 144	1	5	10 11
## 145	2	1	NA 11
## 146	1	5	4 10
## 147	3	5	0 10
## 148	1	5	6 14

## 149	1	1	2 9
## 150	1	3	6 11
## 151	3	1	24 9
## 152	3	5	0 13
## 153	2	2	4 11
## 154	1	5	2 13
## 155	NA	1	4 11
## 156	2	5	22 6
## 157	2	5	0 12
## 158	1	5	0 10
## 159	1	3	2 11
## 160	1	5	6 13
## 161	4	1	6 11
## 162	1	5	16 8
## 163	5	5	0 11
## 164	5	4	0 0
## 165	5	5	6 10
## 166	3	3	2 13
## 167	1	4	6 11
## 168	1	4	NA 13
## 169	1	1	0 8
## 170	3	5	14 10
## 171	5	4	6 11
## 172	2	3	4 11
## 173	4	5	0 1
## 174	5	5	0 10
## 175	2	5	8 9
## 176	NA	3	4 8
## 177	4	5	2 10
## 178	4	2	2 8
## 179	5	5	0 8
## 180	1	2	10 8
## 181	4	NA	0 11
## 182	1	3	0 18
## 183	1	4	0 13
## 184	1	3	0 17
## 185	NA	NA	4 10
## 186	1	3	0 18
## 187	3	5	0 10
## 188	1	3	NA 13
## 189	1	4	0 15
## 190	4	4	0 11
## 191	4	NA	0 14
## 192	NA	4	4 10
## 193	4	3	8 11
## 194	1	2	4 13
## 195	3	3	4 11
## 196	2	3	0 13
## 197	3	5	NA 17
## 198	3	1	32 14
## 199	2	1	8 16
## 200	NA	4	6 14
## 201	2	NA	0 11
## 202	2	5	0 16

## 203	3	3	10 14
## 204	5	3	6 10
## 205	1	2	6 13
## 206	1	3	0 12
## 207	5	5	16 12
## 208	4	5	0 10
## 209	1	3	0 12
## 210	1	5	8 16
## 211	2	5	4 14
## 212	5	3	16 12
## 213	3	2	30 16
## 214	2	3	0 11
## 215	5	2	2 15
## 216	3	4	4 12
## 217	3	1	0 15
## 218	2	3	21 13
## 219	1	5	6 13
## 220	4	5	14 8
## 221	2	4	2 12
## 222	1	1	4 15
## 223	4	5	2 13
## 224	1	4	0 12
## 225	2	3	4 12
## 226	5	3	15 12
## 227	1	4	0 13
## 228	4	5	10 11
## 229	2	3	6 11
## 230	3	1	2 15
## 231	4	1	16 10
## 232	4	4	10 10
## 233	4	NA	4 13
## 234	1	4	NA 13
## 235	2	5	0 11
## 236	1	5	12 12
## 237	1	3	0 14
## 238	5	4	9 10
## 239	1	5	4 16
## 240	1	4	4 8
## 241	3	3	2 17
## 242	3	3	0 11
## 243	NA	3	2 11
## 244	2	3	0 16
## 245	2	3	0 12
## 246	1	1	0 13
## 247	3	NA	0 13
## 248	4	1	0 14
## 249	1	5	2 9
## 250	3	2	0 12
## 251	5	4	0 16
## 252	1	NA	4 10
## 253	2	5	0 13
## 254	1	NA	18 10
## 255	1	5	16 10
## 256	1	3	14 7

## 257	2	1	26	8
## 258	2	5	NA	9
## 259	1	3	4	15
## 260	NA	4	10	10
## 261	2	5	4	11
## 262	1	3	2	13
## 263	1	5	14	8
## 264	5	2	16	8
## 265	1	1	8	10
## 266	NA	5	4	15
## 267	1	4	NA	14
## 268	4	5	8	15
## 269	3	NA	0	12
## 270	1	3	7	15
## 271	2	5	4	15
## 272	4	5	2	12
## 273	1	1	2	15
## 274	3	5	10	11
## 275	1	4	10	10
## 276	1	3	10	11
## 277	1	4	7	16
## 278	2	5	4	11
## 279	1	2	2	13
## 280	5	1	12	5
## 281	3	5	8	10
## 282	4	5	0	11
## 283	4	5	8	7
## 284	NA	2	4	10
## 285	5	NA	4	6
## 286	3	3	2	12
## 287	4	5	0	13
## 288	2	5	0	10
## 289	3	5	2	13
## 290	1	4	2	17
## 291	1	NA	0	11
## 292	4	5	4	11
## 293	3	5	2	14
## 294	3	3	4	14
## 295	NA	5	4	13
## 296	NA	1	4	14
## 297	2	4	2	16
## 298	NA	4	0	10
## 299	1	2	2	12
## 300	2	NA	8	12
## 301	3	2	2	15
## 302	1	NA	2	11
## 303	1	3	2	12
## 304	1	4	2	13
## 305	NA	3	0	13
## 306	3	4	8	9
## 307	4	1	6	16
## 308	4	5	0	14
## 309	2	4	8	12
## 310	3	5	4	14

## 311	2	3	12 10
## 312	3	5	16 12
## 313	NA	2	10 16
## 314	1	3	2 13
## 315	2	1	2 18
## 316	2	1	8 15
## 317	1	1	6 16
## 318	3	5	6 12
## 319	1	5	15 10
## 320	4	3	6 12
## 321	1	4	2 13
## 322	1	1	NA 15
## 323	3	3	0 10
## 324	2	NA	0 10
## 325	4	4	10 11
## 326	4	5	22 10
## 327	4	3	18 13
## 328	1	3	2 18
## 329	1	4	0 13
## 330	2	5	12 14
## 331	1	5	10 14
## 332	NA	4	0 12
## 333	2	2	0 18
## 334	1	3	0 14
## 335	3	2	0 15
## 336	1	2	0 17
## 337	4	5	2 16
## 338	NA	3	NA 18
## 339	NA	3	0 19
## 340	1	4	0 15
## 341	3	5	0 15
## 342	3	2	2 13
## 343	NA	2	0 14
## 344	1	3	0 17
## 345	2	1	0 17
## 346	1	4	0 15
## 347	2	5	0 13
## 348	1	5	0 8
## 349	1	3	0 16
## 350	2	5	0 18
## 351	1	5	0 11
## 352	1	5	0 15
## 353	2	5	0 11
## 354	2	5	2 11
## 355	2	1	2 15
## 356	1	3	2 14
## 357	1	5	2 17
## 358	1	5	2 17
## 359	4	1	8 15
## 360	5	5	2 17
## 361	NA	3	8 14
## 362	NA	1	9 10
## 363	3	5	0 13
## 364	NA	1	4 14

## 365	2	5	2 17
## 366	2	5	14 17
## 367	1	5	0 13
## 368	2	2	2 14
## 369	4	5	2 11
## 370	3	5	12 11
## 371	NA	4	2 9
## 372	4	5	2 10
## 373	1	3	4 13
## 374	2	3	0 10
## 375	3	5	0 17
## 376	3	2	0 15
## 377	2	2	0 14
## 378	2	3	0 13
## 379	5	5	0 17
## 380	5	4	2 10
## 381	3	4	0 13
## 382	2	4	4 15
## 383	5	5	2 11
## 384	4	5	0 12
## 385	2	5	0 10
## 386	1	2	2 10
## 387	NA	5	0 15
## 388	2	5	6 15
## 389	1	4	8 12
## 390	NA	2	0 12
## 391	1	4	6 14
## 392	3	5	8 14
## 393	3	2	0 15
## 394	1	1	4 15
## 395	3	2	0 16
## 396	2	2	0 13
## 397	NA	NA	6 17
## 398	2	4	18 14
## 399	2	3	0 14
## 400	3	1	4 17
## 401	2	4	4 17
## 402	3	5	0 14
## 403	3	NA	0 13
## 404	2	1	10 15
## 405	4	4	4 16
## 406	4	5	16 11
## 407	1	3	6 13
## 408	1	5	0 12
## 409	3	3	11 12
## 410	4	2	9 15
## 411	3	4	NA 17
## 412	2	4	2 15
## 413	1	3	0 17
## 414	NA	4	21 10
## 415	3	3	8 15
## 416	4	NA	5 11
## 417	2	5	10 18
## 418	2	2	5 17

## 419	5	4	13 14
## 420	4	4	10 11
## 421	3	4	10 17
## 422	1	5	5 10
## 423	2	1	4 13
## 424	3	5	11 11
## 425	1	5	0 12
## 426	1	2	6 10
## 427	3	5	4 11
## 428	2	5	0 17
## 429	1	1	0 9
## 430	3	2	5 11
## 431	1	5	0 11
## 432	2	5	0 10
## 433	2	5	0 7
## 434	5	5	0 14
## 435	1	1	4 11
## 436	2	4	0 10
## 437	2	2	4 8
## 438	2	2	0 12
## 439	3	3	2 12
## 440	NA	4	0 16
## 441	5	3	0 0
## 442	4	5	4 9
## 443	2	2	0 14
## 444	2	2	7 8
## 445	NA	5	4 11
## 446	4	4	8 9
## 447	1	5	0 11
## 448	5	NA	8 9
## 449	1	4	6 17
## 450	1	1	3 13
## 451	2	1	2 15
## 452	1	5	0 11
## 453	1	4	NA 11
## 454	2	4	NA 8
## 455	2	4	3 8
## 456	3	2	0 9
## 457	1	NA	0 15
## 458	NA	3	4 11
## 459	1	1	0 13
## 460	1	5	2 10
## 461	1	2	1 11
## 462	3	2	0 14
## 463	2	2	0 14
## 464	2	5	2 12
## 465	4	5	6 11
## 466	3	5	9 8
## 467	3	4	0 11
## 468	1	2	1 14
## 469	2	4	1 13
## 470	1	3	0 13
## 471	NA	1	4 12
## 472	3	5	2 12

## 473	1	4	0 16
## 474	3	4	4 10
## 475	5	3	2 11
## 476	1	4	0 14
## 477	1	5	2 8
## 478	4	3	11 11
## 479	1	NA	0 8
## 480	1	5	4 10
## 481	1	NA	0 10
## 482	1	3	2 11
## 483	3	4	0 9
## 484	2	1	1 11
## 485	2	1	6 8
## 486	2	4	0 11
## 487	4	3	1 10
## 488	1	2	6 10
## 489	1	3	6 9
## 490	4	4	0 10
## 491	1	2	4 10
## 492	1	1	12 9
## 493	1	3	2 10
## 494	5	5	5 10
## 495	3	3	0 9
## 496	1	NA	0 13
## 497	2	4	2 14
## 498	4	NA	0 10
## 499	1	1	0 14
## 500	2	5	0 16
## 501	5	1	12 7
## 502	5	5	8 13
## 503	5	NA	2 9
## 504	1	5	0 14
## 505	1	1	0 13
## 506	2	5	0 11
## 507	4	3	8 10
## 508	NA	3	0 10
## 509	NA	5	NA 9
## 510	1	1	0 18
## 511	1	1	0 17
## 512	NA	4	1 10
## 513	NA	5	9 7
## 514	3	1	0 8
## 515	4	NA	2 7
## 516	4	3	8 10
## 517	3	2	0 16
## 518	NA	2	0 15
## 519	NA	1	8 8
## 520	1	2	0 0
## 521	3	5	6 8
## 522	1	2	0 10
## 523	2	3	4 8
## 524	5	5	2 6
## 525	1	2	2 8
## 526	2	5	0 16

## 527	2	5	1 14
## 528	2	3	0 10
## 529	2	5	5 9
## 530	2	5	1 11
## 531	5	3	8 9
## 532	3	1	0 10
## 533	4	NA	2 8
## 534	1	3	0 16
## 535	5	5	0 12
## 536	NA	5	11 10
## 537	3	5	8 14
## 538	2	5	11 12
## 539	2	5	2 11
## 540	2	1	8 10
## 541	NA	1	5 11
## 542	1	5	0 11
## 543	4	5	1 12
## 544	3	5	2 8
## 545	3	5	2 12
## 546	NA	5	8 8
## 547	1	5	0 16
## 548	1	2	0 11
## 549	2	NA	2 11
## 550	3	5	0 18
## 551	2	5	0 13
## 552	2	1	0 13
## 553	NA	4	2 10
## 554	1	5	4 12
## 555	2	4	3 10
## 556	1	3	5 13
## 557	4	5	4 11
## 558	1	5	2 10
## 559	5	5	0 10
## 560	1	4	0 13
## 561	3	2	0 10
## 562	4	5	6 10
## 563	NA	1	0 12
## 564	3	5	0 0
## 565	3	5	2 10
## 566	4	NA	0 9
## 567	3	5	2 9
## 568	2	5	0 0
## 569	1	3	4 9
## 570	3	3	9 8
## 571	NA	4	6 8
## 572	3	5	4 9
## 573	1	1	8 7
## 574	2	5	9 10
## 575	4	NA	12 10
## 576	4	2	8 10
## 577	5	5	8 11
## 578	NA	2	8 11
## 579	3	3	4 10
## 580	3	3	0 9

## 581	NA	5	4 10
## 582	1	5	2 8
## 583	1	5	0 7
## 584	1	3	0 0
## 585	1	5	0 11
## 586	2	NA	5 8
## 587	3	5	0 0
## 588	2	4	3 8
## 589	1	5	0 9
## 590	1	3	0 10
## 591	2	5	3 7
## 592	1	1	2 14
## 593	1	4	0 13
## 594	2	4	0 14
## 595	2	1	0 18
## 596	1	5	3 17
## 597	2	4	0 18
## 598	1	4	0 0
## 599	5	1	8 11
## 600	1	1	5 14
## 601	4	4	4 14
## 602	1	2	4 10
## 603	4	NA	0 13
## 604	1	5	0 0
## 605	2	2	2 10
## 606	3	2	0 0
## 607	1	5	0 18
## 608	2	NA	5 12
## 609	2	3	2 11
## 610	1	4	0 12
## 611	4	1	0 0
## 612	NA	4	5 15
## 613	3	2	4 11
## 614	1	5	0 10
## 615	2	5	2 12
## 616	2	5	0 15
## 617	2	3	2 14
## 618	1	4	0 18
## 619	4	5	0 15
## 620	3	3	6 13
## 621	1	NA	4 15
## 622	2	3	0 13
## 623	4	3	0 9
## 624	NA	5	0 16
## 625	NA	1	0 9
## 626	2	4	0 10
## 627	2	NA	0 0
## 628	3	3	3 10
## 629	1	3	8 12
## 630	3	1	4 9
## 631	1	1	0 17
## 632	2	4	4 12
## 633	1	3	4 9
## 634	4	2	1 14


```
## 635    2    1    1 16
## 636   NA    1   10  9
## 637    4    2    4 19
## 638    3    5    0  0
## 639    1    3    4 16
## 640    3    5    0  0
## 641    3    3    0  0
## 642    3    4    0 15
## 643    1    1    0 11
## 644    2    5    4 10
## 645    2    5    4 10
## 646    1    1    4 16
## 647    1   NA    6  9
## 648    4    2    6 10
## 649    4    5    4 11
```

Your recipe should have the following specifications in the order below:

```
blueprint <- recipe(x = dat,
                    vars = c(id, outcome, categorical, numeric ),
                    roles = c('id', 'outcome', rep('predictor',30))) |>

step_indicate_na(all_of(categorical),all_of(numeric)) |>
# step_zv(all_numeric()) |>
# step_impute_mean(all_of(numeric)) |>
# step_impute_mode(all_of(categorical)) |>
# step_poly(all_of(numeric),degree=3) |>
#   step_normalize(paste0(numeric,'_poly_1'),
#                  paste0(numeric,'_poly_2')) |>

# One-hot encoding for all categorical variables

step_dummy(all_of(categorical),one_hot=TRUE))
```

- create an indicator variable for missingness for all predictors,
- remove the numeric predictors with zero variance,
- replace missing values with mean for numeric predictors,
- replace missing values with mode for categorical predictors,
- expand numeric predictors using using polynomial basis functions with three degrees of freedom and standardize,
- recode categorical predictors into dummy variables using one-hot encoding.

Print the blueprint.

```
blueprint

##
## -- Recipe -----
##
## -- Inputs
## Number of variables by role
## outcome:    1
## predictor: 30
## id:         1
```

```
##
```

```
## -- Operations
```

```
## * Creating missing data variable indicators for: all_of(categorical), ...
```

Task 2.5 Finally, apply this recipe to the whole dataset and obtain the final version of the dataset with transformed variables. The final dataset should have 649 rows and 114 columns as the following:

- one column representing the ID variable, `id`,
- one column representing the outcome variable, `score`,
- 30 columns representing missing indicator variables,
- three columns for polynomial terms for each of the numeric variables,
- two columns for dummy variables representing `school`,
- two columns for dummy variables representing `sex`,
- two columns for dummy variables representing `address`,
- two columns for dummy variables representing `famsize`,
- two columns for dummy variables representing `Pstatus`,
- five columns for dummy variables representing `Mjob`,
- five columns for dummy variables representing `Fjob`,
- four columns for dummy variables representing `reason`,
- three columns for dummy variables representing `guardian`,
- two columns for dummy variables representing `schoolsup`,
- two columns for dummy variables representing `famsup`,
- two columns for dummy variables representing `paid`,
- two columns for dummy variables representing `activities`,
- two columns for dummy variables representing `nursery`,
- two columns for dummy variables representing `higher`,
- two columns for dummy variables representing `internet`,
- two columns for dummy variables representing `romantic`

Task 2.7 Export the final dataset (649 x 114) as a .csv file.

Characteristic	N = 1,500 ^I
day	
1	297 (20%)
2	156 (10%)
3	92 (6.1%)
4	115 (7.7%)
5	223 (15%)
6	300 (20%)
7	317 (21%)
month	
Apr	87 (5.8%)
Jun	877 (58%)
May	536 (36%)
date	
1	115 (7.7%)
10	22 (1.5%)
11	4 (0.3%)
13	2 (0.1%)
14	20 (1.3%)
15	99 (6.6%)
16	66 (4.4%)
17	87 (5.8%)
18	95 (6.3%)
19	67 (4.5%)
2	86 (5.7%)
20	75 (5.0%)
21	27 (1.8%)
22	57 (3.8%)
23	14 (0.9%)
24	6 (0.4%)
25	26 (1.7%)
26	10 (0.7%)
27	1 (<0.1%)
28	18 (1.2%)
29	65 (4.3%)
3	63 (4.2%)
30	86 (5.7%)
31	99 (6.6%)
4	24 (1.6%)
5	60 (4.0%)
6	98 (6.5%)
7	98 (6.5%)
9	10 (0.7%)
hour	
0	67 (4.5%)
1	74 (4.9%)
10	47 (3.1%)
11	64 (4.3%)
12	53 (3.5%)
13	44 (2.9%)