

# Package ‘nomogramFormula’

May 9, 2026

**Type** Package

**Title** Calculate Total Points and Probabilities for Nomogram

**Version** 1.2.0.0

**Description** A nomogram, which can be carried out in 'rms' package, provides a graphical explanation of a prediction process. However, it is not very easy to draw straight lines, read points and probabilities accurately. Even, it is hard for users to calculate total points and probabilities for all subjects.

This package provides `formula_rd()` and `formula_lp()` functions to fit the formula of total points with raw data and linear predictors respectively by polynomial regression. Function `points_cal()` will help you calculate the total points. `prob_cal()` can be used to calculate the probabilities after `lrm()`, `cph()` or `psm()` regression.

For more complex condition, interaction or restricted cubic spine, `TotalPoints.rms()` can be used.

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**License** GPL-3

**Encoding** UTF-8

**LazyData** true

**Imports** rms, do, Hmisc

**RoxygenNote** 6.1.1

**URL** <https://github.com/yikeshu0611/nomogramFormula>

**BugReports** <https://github.com/yikeshu0611/nomogramFormula/issues>

**NeedsCompilation** no

**Repository** CRAN

**Date/Publication** 2020-01-28 13:10:02 UTC

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formula_lp	<i>Explore the Formula of Total Points and Linear Predictors</i>
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### Description

Explore the formula of total points and linear predictors by the best power.

### Usage

```
formula_lp(nomogram, power, digits = 6)
```

### Arguments

nomogram	results of nomogram() function in 'rms' package
power	power can be automatically selected based on all R2 equal 1
digits	default is 6

### Value

formula is the formula of total points and linear predictors. test is the R2 and RMSE which are used to test the fitted points. diff is difference between nomogram points and fitted points

### Examples

```
library(rms) # needed for nomogram
set.seed(2018)
n <- 2019
age <- rnorm(n, 60, 20)
sex <- factor(sample(c('female', 'male'), n, TRUE))
sex <- as.numeric(sex)
weight <- sample(50:100, n, replace = TRUE)
time <- sample(50:800, n, replace = TRUE)
units(time) = "day"
death <- sample(c(1, 0, 0), n, replace = TRUE)
df <- data.frame(time, death, age, sex, weight)
ddist <- datadist(df)
oldoption <- options(datadist='ddist')
f <- cph(formula(Surv(time, death)~sex+age+weight), data=df,
         x=TRUE, y=TRUE, surv=TRUE, time.inc=3)
```

```

surv <- Survival(f)
nomo <- nomogram(f,
  lp=TRUE,
  fun=list(function(x) surv(365,x),
    function(x) surv(365*2,x)),
  funlabel=c("1-Year Survival Prob",
    "2-Year Survival Prob"))

options(oldoption)
formula_lp(nomogram = nomo)
formula_lp(nomogram = nomo,power = 1)
formula_lp(nomogram = nomo,power = 3,digits=6)

```

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 formula\_rd

*Explore the Formula of Total Points and Raw Data*


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### Description

Explore the formula of total points and raw data by the best power.

### Usage

```
formula_rd(nomogram, power, digits = 6)
```

### Arguments

nomogram	results of nomogram() function in 'rms' package
power	power can be automatically selected based on all R2 equal 1
digits	default is 6

### Value

formula is the formula of total points and raw data. test is the R2 and RMSE which are used to test the fitted points. diff is difference between nomogram points and fitted points

### Examples

```

library(rms) # needed for nomogram
set.seed(2018)
n <- 2019
age <- rnorm(n,60,20)
sex <- factor(sample(c('female','male'),n,TRUE))
sex <- as.numeric(sex)
weight <- sample(50:100,n,replace = TRUE)
time <- sample(50:800,n,replace = TRUE)
units(time)="day"
death <- sample(c(1,0,0),n,replace = TRUE)
df <- data.frame(time,death,age,sex,weight)
ddist <- datadist(df)
oldoption <- options(datadist='ddist')

```

```
f <- cph(formula(Surv(time,death)~sex+age+weight),data=df,
          x=TRUE,y=TRUE,surv=TRUE,time.inc=3)
surv <- Survival(f)
nomo <- nomogram(f,
                 lp=TRUE,
                 fun=list(function(x) surv(365,x),
                           function(x) surv(365*2,x)),
                 funlabel=c("1-Year Survival Prob",
                             "2-Year Survival Prob"))

options(oldoption)
formula_rd(nomogram = nomo)
formula_rd(nomogram = nomo,power = 1)
formula_rd(nomogram = nomo,power = 3,digits=6)
```

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points\_cal

*Calculate Total Points*

---

### Description

Calculate total points.

### Usage

```
points_cal(formula, rd, lp, digits = 6)
```

### Arguments

formula	the formula of total points with raw data or linear predictors
rd	raw data, which cannot have missing values
lp	linear predictors
digits	default is 6

### Value

total Points

### Examples

```
library(rms) # needed for nomogram
set.seed(2018)
n <- 2019
age <- rnorm(n,60,20)
sex <- factor(sample(c('female','male'),n,TRUE))
sex <- as.numeric(sex)
weight <- sample(50:100,n,replace = TRUE)
time <- sample(50:800,n,replace = TRUE)
units(time)="day"
death <- sample(c(1,0,0),n,replace = TRUE)
df <- data.frame(time,death,age,sex,weight)
```

```

ddist <- datadist(df)
oldoption <- options(datadist='ddist')
f <- cph(formula(Surv(time,death)~sex+age+weight),data=df,
          x=TRUE,y=TRUE,surv=TRUE,time.inc=3)
surv <- Survival(f)
nomo <- nomogram(f,
                lp=TRUE,
                fun=list(function(x) surv(365,x),
                          function(x) surv(365*2,x)),
                funlabel=c("1-Year Survival Prob",
                            "2-Year Survival Prob"))
options(oldoption)
#get the formula by the best power using formula_lp
results <- formula_lp(nomo)
points_cal(formula = results$formula,lp=f$linear.predictors)

#get the formula by the best power using formula_rd
results <- formula_rd(nomogram = nomo)
points_cal(formula = results$formula,rd=df)

```

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prob\_cal

*Calculate Probabilities*


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## Description

Use Survival() function from 'rms' package to calculate probabilities after lrm(), cph() or psm() regression. If you want to calculate lrm() probabilities, please leave linear.predictors be TRUE and times be missing. If you want to calculate cph() probabilities, please leave both linear.predictors and surv be TRUE.

## Usage

```
prob_cal(reg, times, q, lp)
```

## Arguments

reg	regression results after lrm(), cph() or psm() in 'rms' package.
times	if you want to calculate probabilities for lrm() function, please left times missing.
q	quantile, for example 0.5
lp	linear predictors

## Value

linear predictors and probabilities as a dataframe

## Examples

```

set.seed(2018)
n <- 2019
age <- rnorm(n, 60, 20)
sex <- factor(sample(c('female', 'male'), n, TRUE))
sex <- as.numeric(sex)
weight <- sample(50:100, n, replace = TRUE)
time <- sample(50:800, n, replace = TRUE)
units(time) = "day"
death <- sample(c(1, 0, 0), n, replace = TRUE)
df <- data.frame(time, death, age, sex, weight)

library(rms) #needed for lrm(), cph() and psm()
ddist <- datadist(df)
oldoption <- options(datadist='ddist')

# lrm() function
f <- lrm(death~sex+age+weight, data=df,
         linear.predictors = TRUE)
head(prob_cal(reg = f))

# cph() function
f <- cph(Surv(time, death)~sex+age+weight, data=df,
         linear.predictors=TRUE, surv=TRUE)
head(prob_cal(reg = f, times = c(365, 365*2)))

# psm() function
f <- psm(Surv(time, death)~sex+age+weight, data=df)
head(prob_cal(reg = f, times = c(365, 365*2)))

```

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TotalPoints.rms

*Calculate Total Points for nomogram Picture*

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## Description

Compared with `points_cal()` command, `TotalPoints.rms()` is suit for more complexed condition. Since this command is based on formula from 'rms' package, it may be also more accurate. However, formula for each variable can not be calculated.

## Usage

```
TotalPoints.rms(rd, fit, nom, kint = NULL)
```

## Arguments

<code>rd</code>	raw data
<code>fit</code>	regression result in 'rma' package
<code>nom</code>	nomoram() command result
<code>kint</code>	number of intercept. Default is to use <code>fit\$interceptRef</code> if it exists, or 1.

**Value**

a dataframe contains rawdata and total points

**Examples**

```
library(rms)
n <- 1000
set.seed(17)
d <- data.frame(age = rnorm(n, 50, 10),
                blood.pressure = rnorm(n, 120, 15),
                cholesterol = rnorm(n, 200, 25),
                sex = factor(sample(c('female','male'), n,TRUE)))

d <- upData(d,
            L = .4*(sex=='male') + .045*(age-50) +
              (log(cholesterol - 10)-5.2)*(-2*(sex=='female') + 2*(sex=='male')),
            y = ifelse(runif(n) < plogis(L), 1, 0))

ddist <- datadist(d); options(datadist='ddist')

f <- lrm(y ~ lsp(age,50) + sex * rcs(cholesterol, 4) + blood.pressure,
        data=d)
nom <- nomogram(f)
TotalPoints.rms(rd = d,fit = f,nom = nom)
```

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