Introduccion a R y RStudio

Taller de Introduccion a R y manejo de informacion grillada

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¿Qué es R?

"R es un lenguaje y entorno de libre acceso para la computación estadística y gráficos que proporciona una amplia variedad de técnicas estadísticas y gráficas: modelado lineal y no lineal, pruebas estadísticas, análisis de series temporales, clasificación, clustering, etc."

- **R core group**

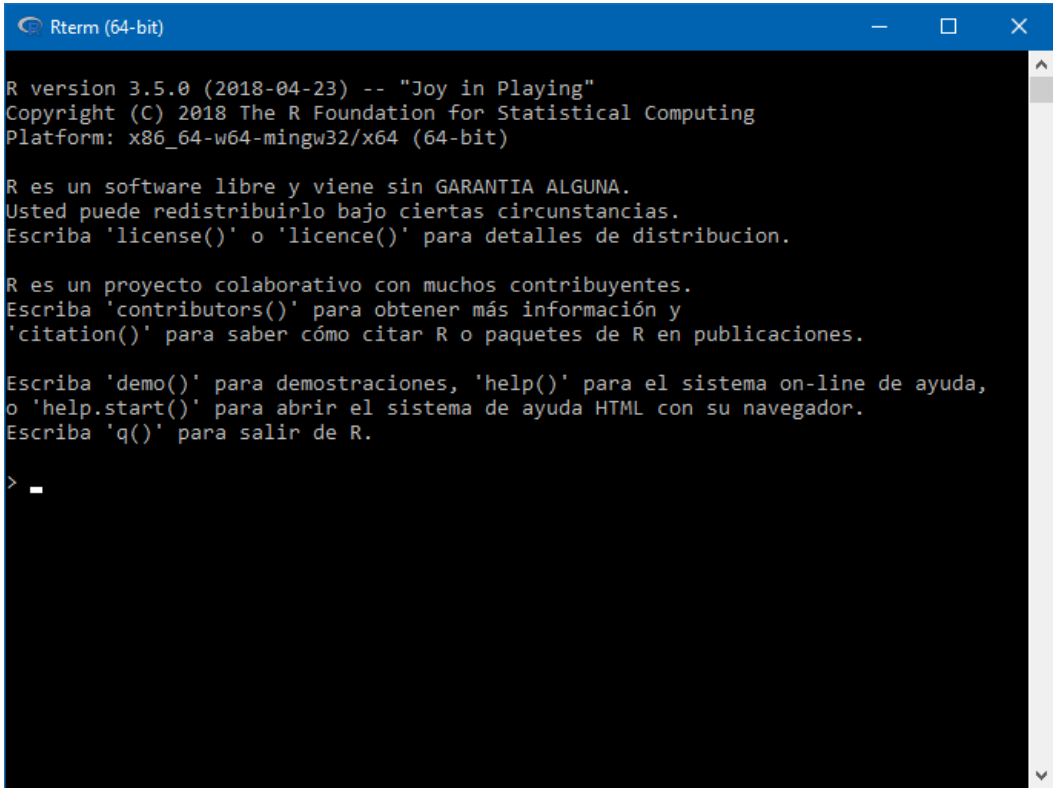
Descargar R y RStudio

https://cloud.r-project.org/

https://www.rstudio.com/products/rstudio/download/

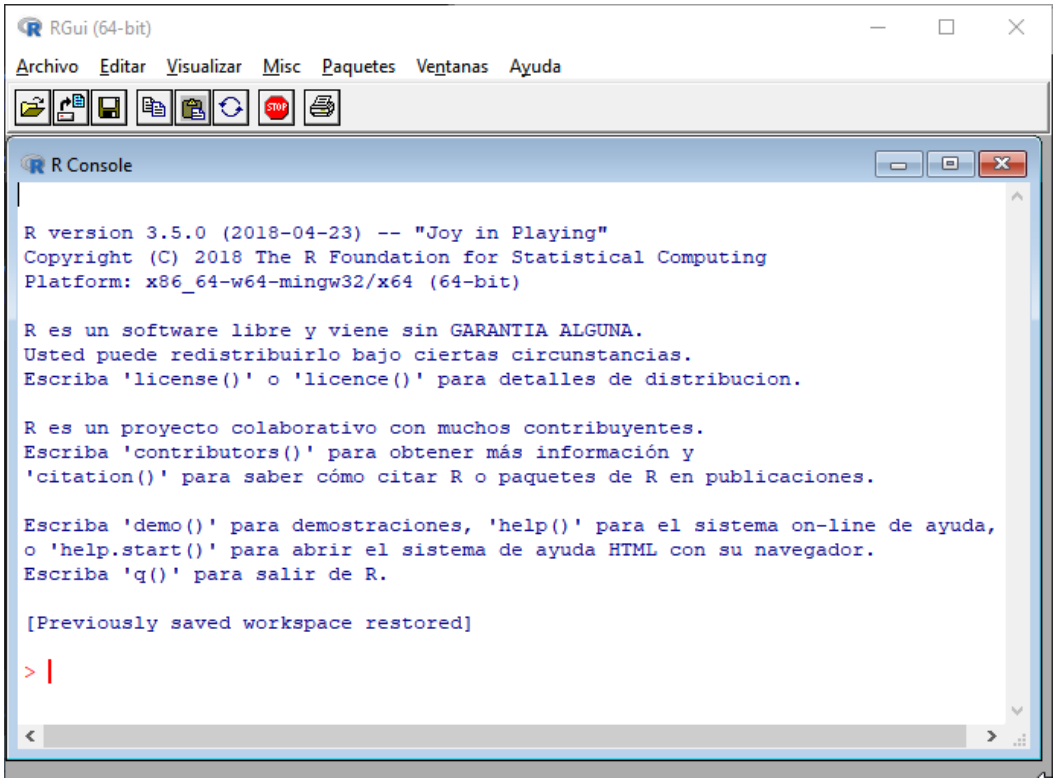
R

https://www.r-project.org/

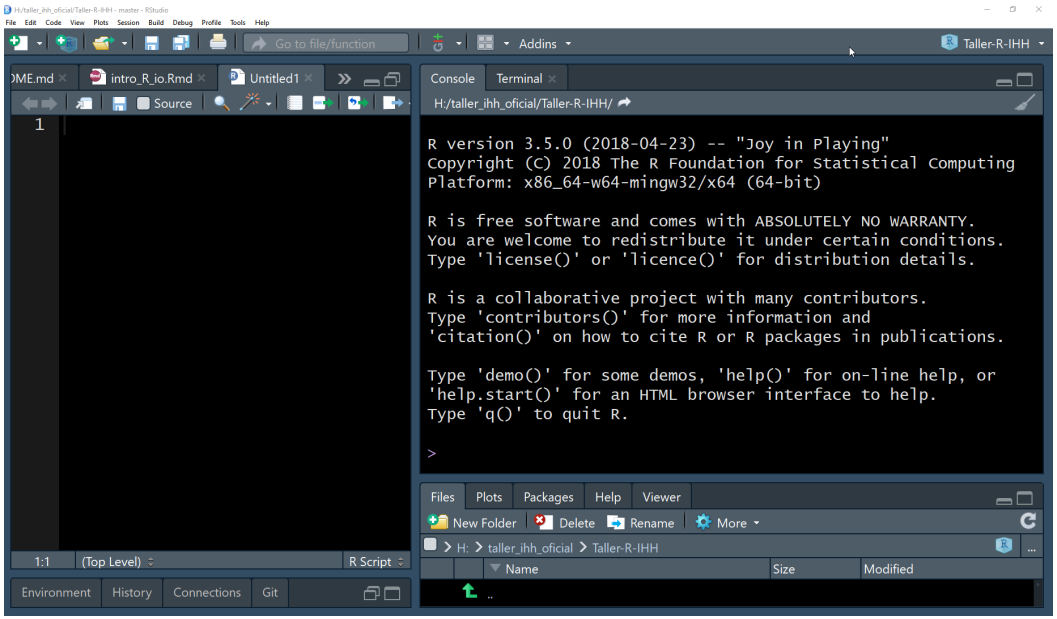


R

https://www.r-project.org/

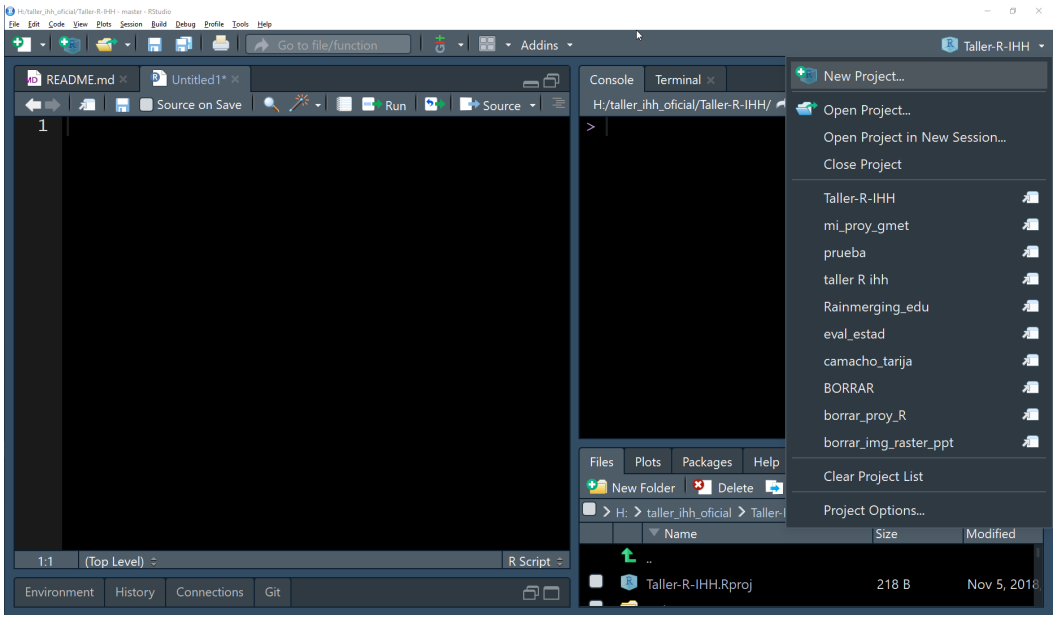


RStudio



https://www.rstudio.com/

Crear proyecto



- Para poder operar de forma ordenada es recomendable crear un **Proyecto** que contenga la información de entrada, salidas, scripts, etc.
- De esa forma las rutas de acceso se vuelven relativas sin depender de un árbol de carpetas propio de cada usuario.

Librerías

```
install.packages('beepr', repos = 'https://cloud.r-project.org')
```

```
## Installing package into 'C:/Users/HP/Documents/R/win-library/3.5'
## (as 'lib' is unspecified)
## package 'beepr' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\HP\AppData\Local\Temp\RtmpQznvOp\downloaded_packages
```

```
library(beepr)
```

```
## Warning: package 'beepr' was built under R version 3.5.1
```

```
beep(sound = 8)
```

Librerías

Instalar librerias

```
install.packages('raster')
install.packages('openxlsx')
install.packages('ncdf4')
install.packages('lubridate')
```

Tipos de objetos en R

Vector número rico

```
precipitacion <- c(6, 7, 24, 17, 20.5, 20.5, 20, 12, 11, 14, 38,
                   9.5, 8, 5.5, 7)
head(precipitacion)
```

```
## [1]  6.0  7.0 24.0 17.0 20.5 20.5
```

Vector de caracteres

```
fecha <- c('1991-01-01', '1991-01-02', '1991-01-03', '1991-01-04',
           '1991-01-05', '1991-01-06', '1991-01-07', '1991-01-08',
           '1991-01-09', '1991-01-10', '1991-01-11', '1991-01-12',
           '1991-01-13', '1991-01-14', '1991-01-15')
head(fecha, 4)
```

```
## [1] "1991-01-01" "1991-01-02" "1991-01-03" "1991-01-04"
```

Tipos de objetos en R

Factores

```
(valores <- factor(c('b', 'b', 'd', 'c', 'd'),
                   levels = c('a', 'b', 'c', 'd')))
```

```
## [1] b b d c d
## Levels: a b c d
```

```
table(valores)
```

```
## valores
## a b c d
## 0 2 1 2
```

Variables lógicas

```
a <- 2
b <- 3
a == b # ¿es a igual a b?
```

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

Tipos de objetos en R

Matrices

```
(A <- matrix(c(-67, -16, -68.5, -17.5), byrow = TRUE, ncol = 2))
```

```
##       [,1]  [,2]
## [1,] -67.0 -16.0
## [2,] -68.5 -17.5
```

Data frames

```
datos <- data.frame(fecha, precipitacion)
head(datos)
```

```
##        fecha precipitacion
## 1 1991-01-01           6.0
## 2 1991-01-02           7.0
## 3 1991-01-03          24.0
## 4 1991-01-04          17.0
## 5 1991-01-05          20.5
## 6 1991-01-06          20.5
```

Tipos de objetos en R

Listas

```
(mi_lista <- list(matriz = A, df = datos))
```

```
## $matriz
##       [,1]  [,2]
## [1,] -67.0 -16.0
## [2,] -68.5 -17.5
##
## $df
##         fecha precipitacion
## 1  1991-01-01           6.0
## 2  1991-01-02           7.0
## 3  1991-01-03          24.0
## 4  1991-01-04          17.0
## 5  1991-01-05          20.5
## 6  1991-01-06          20.5
## 7  1991-01-07          20.0
## 8  1991-01-08          12.0
## 9  1991-01-09          11.0
## 10 1991-01-10          14.0
## 11 1991-01-11          38.0
```

Tipos de objetos en R

Fechas

```
class(fecha)
```

```
## [1] "character"
```

```
fecha_formato <- as.Date(fecha) # ojo!
head(fecha_formato, 4)
```

```
## [1] "1991-01-01" "1991-01-02" "1991-01-03" "1991-01-04"
```

```
class(fecha_formato)
```

```
## [1] "Date"
```

Funciones

Si una tarea se repite mas de dos veces es hora de crear una funcion.

```
is.leapyear <- function(year){
    condicion_1 <- (year %% 4 == 0)
    condicion_2 <- (year %% 100 != 0)
    condicion_3 <- (year %% 400 == 0)
    return((condicion_1 & condicion_2) | condicion_3)
}
```

Operaciones lógicas

==, <, >, <=, >=, %in%

```
a <- 1 ; b <- c(1, 2, 3)
```

```
a == b
```

```
## [1]  TRUE FALSE FALSE
```

```
a <= b
```

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

```
a %in% b
```

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

```
5 %in% b
```

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

Indexacion

Vector []

```
fecha_formato[2]
```

```
## [1] "1991-01-02"
```

Matriz y data frame []

```
datos[1,2]
```

```
## [1] 6
```

```
head(datos[,2], 11)
```

```
##  [1]  6.0  7.0 24.0 17.0 20.5 20.5 20.0 12.0 11.0 14.0 38.0
```

Data frame $

```
datos_precip <- datos$precipitacion
head(datos_precip, 11)
```

```
##  [1]  6.0  7.0 24.0 17.0 20.5 20.5 20.0 12.0 11.0 14.0 38.0
```

Indexacion

Listas [], [[]], $

```
mi_lista[1]
```

```
## $matriz
##       [,1]  [,2]
## [1,] -67.0 -16.0
## [2,] -68.5 -17.5
```

```
mi_lista[[1]]
```

```
##       [,1]  [,2]
## [1,] -67.0 -16.0
## [2,] -68.5 -17.5
```

```
mi_lista$matriz
```

```
##       [,1]  [,2]
## [1,] -67.0 -16.0
## [2,] -68.5 -17.5
```

Información de objetos

Propiedades de los datos

```
str(datos) # data frame
```

```
## 'data.frame':    15 obs. of  2 variables:
##  $ fecha        : Factor w/ 15 levels "1991-01-01","1991-01-02",..: 1 2
##  $ precipitacion: num  6 7 24 17 20.5 20.5 20 12 11 14 ...
```

```
str(mi_lista) # lista
```

```
## List of 2
##  $ matriz: num [1:2, 1:2] -67 -68.5 -16 -17.5
##  $ df    :'data.frame':  15 obs. of  2 variables:
##   ..$ fecha        : Factor w/ 15 levels "1991-01-01","1991-01-02",..: 1
##   ..$ precipitacion: num [1:15] 6 7 24 17 20.5 20.5 20 12 11 14 ...
```

Algunos estadísticos

```
summary(datos$precipitacion)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    5.50    7.50   12.00   14.67   20.25   38.00
```

Bucles vs Vectorización

Bucles

```
salida <- vector()
for (i in 1:3) { salida[i] <- paste('indice', i, sep = '=') }
salida
```

```
## [1] "indice=1" "indice=2" "indice=3"
```

Vectorización

```
sapply(1:3, function(i) paste('indice', i, sep = '='))
```

```
## [1] "indice=1" "indice=2" "indice=3"
```

Ejemplo: Manipulacion de informacion tabular

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Estación:		San Calixto							Latitud Sud:		16° 29' 43"		
2	Departamento:		La Paz							Longitud Oeste:		68° 7' 57"		
3	Provincia:		Murillo							Altitud m/s/n/m:		3658		
4	DATOS DE : PRECIPITACIÓN DIARIA (mm)													
5	1981													
6	DIA	ENE	FEB	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DIC	TOTAL
7	1	8.0	0.3	8.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	19.2
8	2	0.8	4.5	1.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9
9	3	11.9	0.0	3.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	4.7	21.0
10	4	22.4	0.0	0.3	0.0	0.0	0.0	0.0	0.0	22.8	0.0	0.0	0.2	45.7
11	5	8.1	0.0	2.1	0.0	0.0	0.0	0.0	3.7	0.0	9.4	3.2	0.0	26.5
12	6	1.0	18.2	2.3	0.7	0.0	0.0	0.0	9.4	0.0	0.7	1.5	0.0	33.8
13	7	0.0	29.1	13.1	3.8	0.0	0.0	0.0	1.4	0.0	5.0	0.0	0.0	52.4
14	8	3.6	3.5	12.1	0.0	0.0	0.0	0.0	0.3	0.0	8.5	6.6	0.0	34.6
15	9	1.1	7.4	17.8	10.2	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	37.3
16	10	7.8	6.3	0.5	11.3	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	35.0
17	11	3.8	0.0	0.0	20.5	2.2	0.0	0.0	0.0	0.6	0.0	0.0	2.0	29.1
18	12	3.7	0.0	6.8	0.0	0.7	0.0	0.0	0.4	0.1	0.0	0.0	0.0	11.7
19	13	5.7	19.0	0.3	1.3	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	27.9
20	14	5.3	2.6	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	9.3
21	15	1.9	3.1	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	2.2	8.1
22	16	22.8	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.6	24.4
23	17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.7
24	18	9.4	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	11.2
25	19	7.8	0.5	3.4	0.0	0.0	0.0	0.0	0.0	2.0	0.0	3.3	1.7	18.7
26	20	0.5	11.5	0.0	0.0	1.3	0.0	0.0	0.0	0.7	0.0	0.0	1.1	15.1
27	21	4.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	8.3	0.8	0.5	7.0	21.4
28	22	0.0	5.0	0.6	0.0	0.0	0.0	0.0	0.0	0.9	3.5	0.0	0.0	10.0
29	23	0.0	0.3	1.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.5	2.0	4.9
30	24	0.0	13.8	0.0	0.0	0.0	0.0	0.0	0.0	8.7	6.0	0.3	2.7	31.5
31	25	0.0	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	7.7	0.0	15.5
32	26	7.1	3.2	0.3	0.0	0.0	0.0	0.0	0.0	5.5	6.6	0.0	2.0	24.7
33	27	19.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2	0.0	3.5	37.4
34	28	2.6	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.2	0.0	11.4
35	29	0.0	****	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	4.1	4.9
36	30	0.0	****	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	6.0	6.3
37	31	0.0	****	0.0	****	0.0	****	0.0	0.0	****	6.8	****	0.4	7.2
38	SUM	159.0	137.7	75.4	48.8	4.2	0.0	0.0	27.4	51.1	70.3	28.0	42.9	644.8
39	MED	7.2	6.9	4.2	7.0	1.4	0.0	0.0	3.0	4.6	5.0	2.3	2.5	4.4
40	MAX	22.8	29.1	17.8	20.5	2.2	0.0	0.0	9.4	22.8	14.2	7.7	7.0	29.1
41	MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	N	22.0	20.0	18.0	7.0	3.0	0.0	0.0	9.0	11.0	14.0	12.0	17.0	133.0
43														
44	AÑO: 1982													
45	DIA	ENE	FEB	MAR	ABR	MAY	JUN	JUL	AGO	SEP	OCT	NOV	DIC	TOTAL
46	1	1.0	0.0	11.7	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.5	0.0	14.2
47	2	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	2.1
48	3	12.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.6
49	4	6.4	0.0	24.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.6	31.5
50	5	5.6	0.0	3.7	3.8	0.0	0.0	0.0	0.0	2.7	0.3	0.0	11.5	27.6
51	6	2.4	0.0	0.0	11.9	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	15.3
52	7	9.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	12.6
53	8	6.7	1.7	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.6	10.5

	A	B
1	fecha	San_Calixto
2	01/01/1981	8
3	02/01/1981	0.8
4	03/01/1981	11.9
5	04/01/1981	22.4
6	05/01/1981	8.1
7	06/01/1981	1
8	07/01/1981	0
9	08/01/1981	3.6
10	09/01/1981	1.1
11	10/01/1981	7.8
12	11/01/1981	3.8
13	12/01/1981	3.7
14	13/01/1981	5.7
15	14/01/1981	5.3
16	15/01/1981	1.9
17	16/01/1981	22.8
18	17/01/1981	0
19	18/01/1981	9.4
20	19/01/1981	7.8
21	20/01/1981	0.5
22	21/01/1981	4.7
23	22/01/1981	0
24	23/01/1981	0
25	24/01/1981	0
26	25/01/1981	0
27	26/01/1981	7.1
28	27/01/1981	19
29	28/01/1981	2.6
30	29/01/1981	0
31	30/01/1981	0
32	31/01/1981	0
33	01/02/1981	0.3
34	02/02/1981	4.5
35	03/02/1981	0
36	04/02/1981	0
37	05/02/1981	0
38	06/02/1981	18.2
39	07/02/1981	29.1
40	08/02/1981	3.5
41	09/02/1981	7.4
42	10/02/1981	6.3