Introduction to dates

WORKING WITH DATES AND TIMES IN R

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Instructor

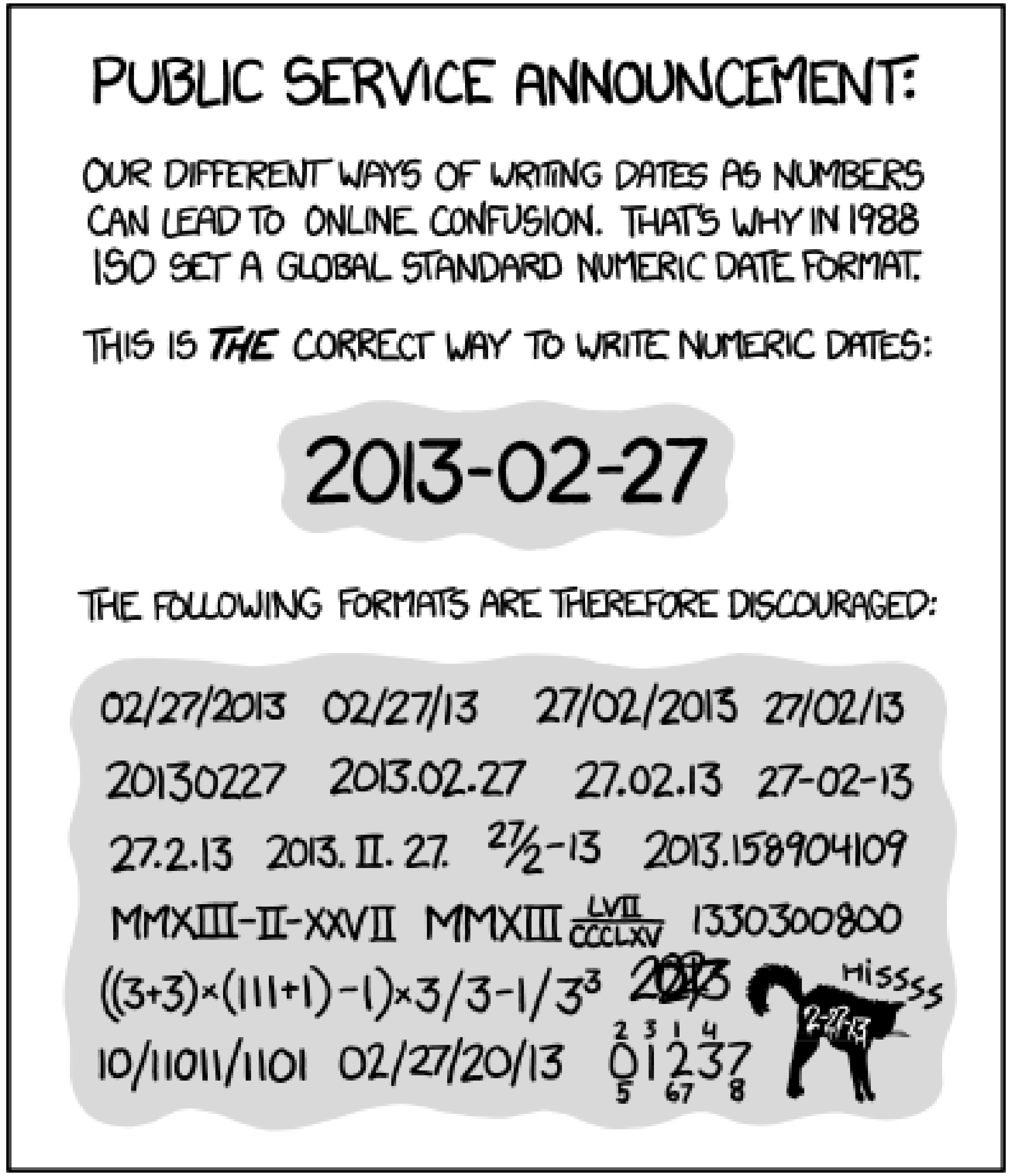
Dates

Different conventions in different places

27th Feb 2013

- NZ: 27/2/2013
- USA: 2/27/2013

The global standard numeric date format



PUBLIC SERVICE ANNOUNCEMENT:

OUR DIFFERENT WAYS OF WRITING DATES AS NUMBERS CAN LEAD TO ONLINE CONFUSION. THAT'S WHY IN 1988 ISO SET A GLOBAL STANDARD NUMERIC DATE FORMAT.

THIS IS ***THE*** CORRECT WAY TO WRITE NUMERIC DATES:

2013-02-27

THE FOLLOWING FORMATS ARE THEREFORE DISCOURAGED:

[1] https://xkcd.com/1179/

ISO 8601 YYYY-MM-DD

- Values ordered from the largest to smallest unit of time
- Each has a fixed number of digits, must be padded with leading zeros
- Either, no separators for computers, or `-` in dates
- 1st of January 2011 -> 2011-01-01

Dates in R

```
2003-02-27
```

```
1974
```

```
"2003-02-27"
```

```
"2003-02-27"
```

```
str("2003-02-27")
```

```
chr "2003-02-27"
```

```
as.Date("2003-02-27")
```

```
"2003-02-27"
```

```
str(as.Date("2003-02-27"))
```

```
Date[1:1], format: "2003-02-27"
```

- Packages that import dates: `readr` , `anytime`

Let's practice!

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Why use dates?

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Dates act like numbers

`Date` objects are stored as days since 1970-01-01

```r
as.Date("2003-02-27") > as.Date("2002-02-27")
```

```
TRUE
```

```r
as.Date("2003-02-27") + 1
```

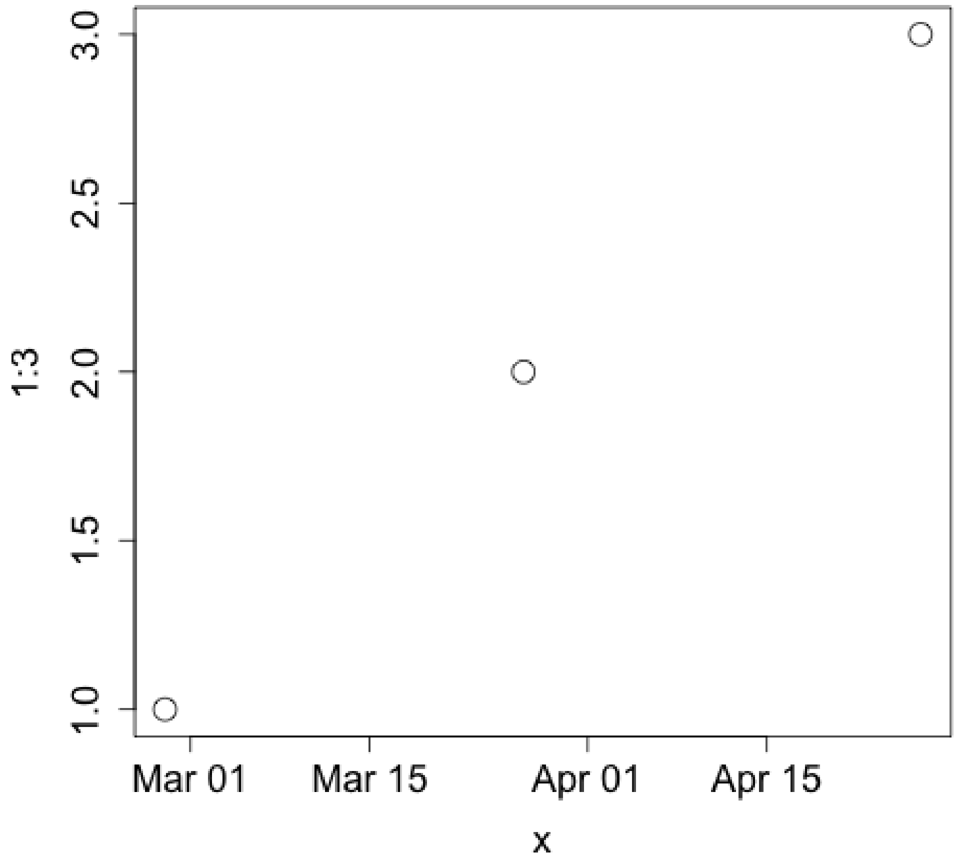
```
"2003-02-28"
```

```r
as.Date("2003-02-27") - as.Date("2002-02-27")
```

```
Time difference of 365 days
```

Plotting with dates

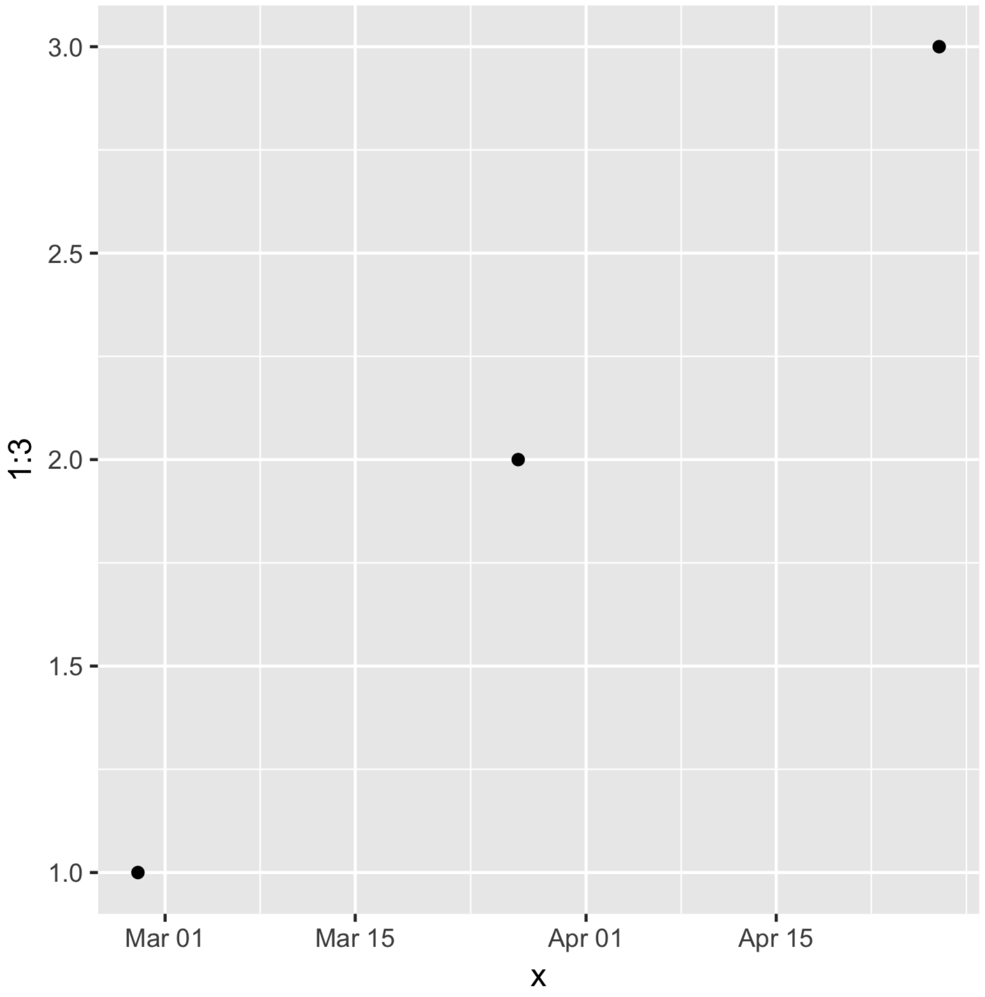
```
x <- c(as.Date("2003-02-27"),
       as.Date("2003-03-27"),
       as.Date("2003-04-27"))
plot(x, 1:3)
```



Plotting with dates

```
x <- c(as.Date("2003-02-27"),
       as.Date("2003-03-27"),
       as.Date("2003-04-27"))

library(ggplot2)
ggplot() +
  geom_point(aes(x = x, y = 1:3))
```



R releases

```
releases
```

```
# A tibble: 105 x 7
   major minor patch       date            datetime      time  type
   <int> <int> <int>     <date>              <dttm>    <time> <chr>
 1     0    60    NA 1997-12-04 1997-12-04 08:47:58 08:47:58 patch
 2     0    61    NA 1997-12-21 1997-12-21 13:09:22 13:09:22 minor
 3     0    61     1 1998-01-10 1998-01-10 00:31:55 00:31:55 patch
 4     0    61     2 1998-03-14 1998-03-14 19:25:55 19:25:55 patch
 5     0    61     3 1998-05-02 1998-05-02 07:58:17 07:58:17 patch
 6     0    62    NA 1998-06-14 1998-06-14 12:56:20 12:56:20 minor
 7     0    62     1 1998-06-14 1998-06-14 22:13:25 22:13:25 patch
 8     0    62     2 1998-07-10 1998-07-10 11:13:45 11:13:45 patch
 9     0    62     3 1998-08-28 1998-08-28 09:02:19 09:02:19 patch
10     0    62     4 1998-10-23 1998-10-23 12:08:41 12:08:41 patch
# ... with 95 more rows
```

Let's practice!

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What about times?

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ISO 8601

HH:MM:SS

- Largest unit to smallest
- Fixed digits
  - Hours: 00 -- 24
  - Minutes: 00 -- 59
  - Seconds: 00 -- 60 (60 only for leap seconds)
- No separator or `:`

Datetimes in R

- Two objects types:
  - `POSIXlt` - list with named components
  - `POSIXct` - seconds since 1970-01-01 00:00:00
- `POSIXct` will go in a data frame
- `as.POSIXct()` turns a string into a `POSIXct` object

```
x <- as.POSIXct("1970-01-01 00:01:00")
str(x)
```

```
 POSIXct[1:1], format: "1970-01-01 00:01:00"
```

Timezones

- `"2013-02-27T18:00:00"` - 6pm local time
- `"2013-02-27T18:00:00Z"` - 6pm UTC
- `"2013-02-27T18:00:00-08:00"` - 6pm in Oregon

```
as.POSIXct("2013-02-27T18:00:00Z")
```

```
"2013-02-27 PST"
```

```
as.POSIXct("2013-02-27T18:00:00Z", tz = "UTC")
```

```
"2013-02-27 UTC"
```

Datetimes behave nicely too

Once a `POSIXct` object, datetimes can be:

- Compared
- Subtracted
- Plotted

Let's practice!

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Why lubridate?

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lubridate

- Make working with dates and times in R easy!
- `tidyverse` package
  - Plays nicely with builtin datetime objects
  - Designed for humans not computers
- Plays nicely with other `tidyverse` packages
- Consistent behaviour regardless of underlying object

Parsing a wide range of formats

```
ymd("2013-02-27")
```

```
"2013-02-27"
```

```
dmy("27/2/13")
```

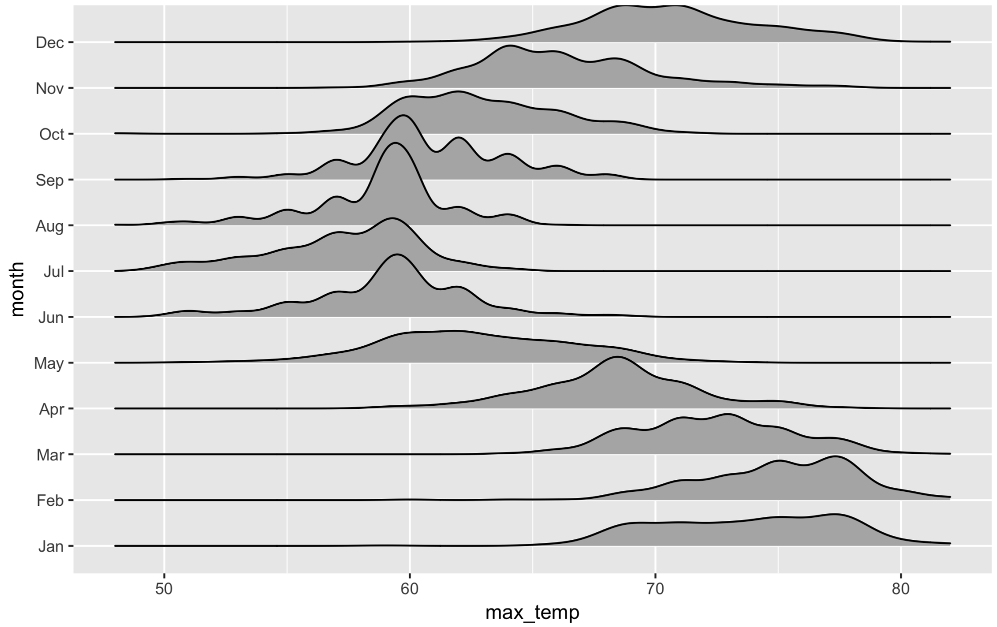
```
"2013-02-27"
```

```
parse_date_time(c("Feb 27th, 2017", "27th Feb 2017"),
+   order = c("mdy", "dmy"))
```

```
"2017-02-27 UTC" "2017-02-27 UTC"
```

Manipulating datetimes

```
# Extract components
akl_daily <- akl_daily %>%
  mutate(
    year = year(date),
    yday = yday(date),
    month = month(date, label = TRUE)
  )
```



Time spans

```
# A tibble: 131 x 3
            name             period
           <chr>        <S4: Period>
1  Elizabeth II 65y 7m 27d 0H 0M 0S
2      Victoria  63y 7m 2d 0H 0M 0S
3      George V 25y 8m 14d 0H 0M 0S
4    George III 19y 0m 28d 0H 0M 0S
5     George VI 15y 1m 26d 0H 0M 0S
```

Other lubridate features

- Handling timezones
- Fast parsing of standard formats
- Outputting datetimes

Let's practice!

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