



WORKING WITH DATES AND TIMES IN R

Taking differences of datetimes

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Instructor



Arithmetic for datetimes

- `datetime_1 - datetime2`: Subtraction for time elapsed
- `datetime_1 + (2 * timespan)`: Addition and multiplication for generating new datetimes in the past or future
- `timespan1 / timespan2`: Division for change of units



Subtraction of datetimes

```
> releases <- read_csv("rversions.csv")
> last_release <- filter(releases, date == max(date))

> Sys.Date() - last_release$date
Time difference of 99 days

> difftime(Sys.Date(), last_release$date)
Time difference of 99 days
```

`time1 - time2` is the same as `difftime(time1, time2)`



difftime()

units = "secs", "mins", "hours", "days", or "weeks"

```
> difftime(Sys.Date(), last_release$date, units = "secs")  
Time difference of 8553600 secs  
  
> difftime(Sys.Date(), last_release$date, units = "weeks")  
Time difference of 14.14286 weeks
```



now() and today()

```
> today()
[1] "2017-10-07"

> str(today())
Date[1:1], format: "2017-10-07"

> now()
[1] "2017-10-07 09:44:52 PDT"

> str(now())
POSIXct[1:1], format: "2017-10-07 09:44:59"
```



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Let's practice!



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Time spans

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Time spans in lubridate

PERIOD

- Human concept of a time span
- `datetime + period of one day =`
same time on the next date
- variable length

DURATION

- Stopwatch concept of a time span
- `datetime + duration of one day =`
`datetime + 86400 seconds`
- fixed number of seconds



Creating a time span

```
> days()  
[1] "1d 0H 0M 0S"  
  
> days(x = 2)  
[1] "2d 0H 0M 0S"  
  
> ddays(2)  
[1] "172800s (~2 days)"
```



Arithmetic with time spans

```
> 2 * days()  
[1] "2d 0H 0M 0S"  
  
> days() + days()  
[1] "2d 0H 0M 0S"  
  
> ymd("2011-01-01") + days()  
[1] "2011-01-02"
```



Functions to create time spans

Time span	Duration	Period
Seconds	dseconds()	seconds()
Minutes	dminutes()	minutes()
Hours	dhours()	hours()
Days	ddays()	days()
Weeks	dweeks()	weeks()
Months	-	months()
Years	dyears()	years()



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Intervals

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Creating intervals

`datetime1 %--% datetime2`, or
`interval(datetime1, datetime2)`

```
> dmy("5 January 1961") %--% dmy("30 January 1969")  
[1] 1961-01-05 UTC--1969-01-30 UTC  
  
> interval(dmy("5 January 1961"), dmy("30 January 1969"))  
[1] 1961-01-05 UTC--1969-01-30 UTC
```



Operating on an interval

```
> beatles <- dmy("5 January 1961") %--% dmy("30 January 1969")

> int_start(beatles)
[1] "1961-01-05 UTC"

> int_end(beatles)
[1] "1969-01-30 UTC"

> int_length(beatles)
[1] 254620800

> as.period(beatles)
[1] "8y 0m 25d 0H 0M 0S"

> as.duration(beatles)
[1] "254620800s (~8.07 years)"
```

Comparing intervals

```
> hendrix_at_woodstock <- mdy("August 17 1969")  
  
> hendrix_at_woodstock %within% beatles  
[1] FALSE  
  
> hendrix <- dmy("01 October 1966") %--% dmy("16 September 1970")  
  
> int_overlaps(beatles, hendrix)  
[1] TRUE
```




Which kind of time span?

Use:

- **Intervals** when you have a *start* and *end*
- **Periods** when you are interested in human units
- **Durations** if you are interested in seconds elapsed

Monarchs of England

Monarchs of Britain:

https://en.wikipedia.org/wiki/List_of_monarchs_in_Britain_by_length_of_reign

```
> monarchs
# A tibble: 131 x 4
```

	name <chr>	from <dtm>	to <dtm>	dominion <chr>
1	Elizabeth II	1952-02-06	2017-10-07	United Kingdom
2	Victoria	1837-06-20	1901-01-22	United Kingdom
3	George V	1910-05-06	1936-01-20	United Kingdom
4	George III	1801-01-01	1820-01-29	United Kingdom

```
# ... with 127 more rows
```



Halley's comet

Halley's comet:

https://en.wikipedia.org/wiki/Halley%27s_Comet#Apparitions

```
> halleys
# A tibble: 27 x 6
  designation year perihelion_date start_date end_date distance
  <chr> <int>      <date>      <date>      <date>      <chr>
1 1P/66 B1, 66    66    0066-01-26 0066-01-25 0066-01-26    <NA>
2 1P/141 F1, 141  141    0141-03-25 0141-03-22 0141-03-25    <NA>
3 1P/218 H1, 218  218    0218-04-06 0218-04-06 0218-05-17    <NA>
4 1P/295 J1, 295  295    0295-04-07 0295-04-07 0295-04-20    <NA>
# ... with 23 more rows
```



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