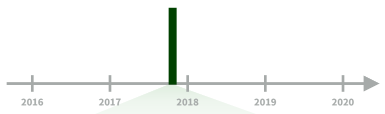
Dates and times with lubridate : : CHEAT SHEET

Date-times



2017-11-28 12:00:00

2017-11-28 12:00:00
A **date-time** is a point on the timeline, stored as the number of seconds since 1970-01-01 00:00:00 UTC

*dt <- **as_datetime**(1511870400)*
"2017-11-28 12:00:00 UTC"

2017-11-28
A **date** is a day stored as the number of days since 1970-01-01

*d <- **as_date**(17498)*
"2017-11-28"

12:00:00
An hms is a **time** stored as the number of seconds since 00:00:00

*t <- hms::**as.hms**(85)*
00:01:25

PARSE DATE-TIMES (Convert strings or numbers to date-times)

1. Identify the order of the year (**y**), month (**m**), day (**d**), hour (**h**), minute (**m**) and second (**s**) elements in your data.
2. Use the function below whose name replicates the order. Each accepts a tz argument to set the time zone, e.g. ymd(x, tz = "UTC").

2017-11-28T14:02:00 — **ymd_hms(), ymd_hm(), ymd_h().** ymd_hms("2017-11-28T14:02:00")

2017-22-12 10:00:00 — **ydm_hms(), ydm_hm(), ydm_h().** ydm_hms("2017-22-12 10:00:00")

11/28/2017 1:02:03 — **mdy_hms(), mdy_hm(), mdy_h().** mdy_hms("11/28/2017 1:02:03")

1 Jan 2017 23:59:59 — **dmy_hms(), dmy_hm(), dmy_h().** dmy_hms("1 Jan 2017 23:59:59")

20170131 — **ymd(), ydm().** ymd(20170131)

July 4th, 2000 — **mdy(), myd().** mdy("July 4th, 2000")

4th of July '99 — **dmy(), dym().** dmy("4th of July '99")

2001: Q3 — **yq()** Q for quarter. yq("2001: Q3")

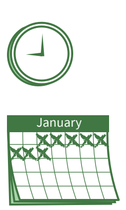
07-2020 — **my(), ym().** my("07-2020")

2:01 — hms::**hms()** Also lubridate::**hms()**, **hm()** and **ms()**, which return periods.* hms::hms(sec = 0, min= 1, hours = 2, roll = FALSE)

as.Date(42705, origin = "1899-12-30")

2017.5 — **date_decimal**(decimal, tz = "UTC") date_decimal(2017.5)

now(tzone = "") Current time in tz (defaults to system tz). now()



today(tzone = "") Current date in a tz (defaults to system tz). today()

fast_strptime() Faster strptime. fast_strptime('9/1/01', '%y/%m/%d')

parse_date_time() Easier strptime. parse_date_time("9/1/01", "ymd")

make_date(2018,12,31)

GET AND SET COMPONENTS

Use an accessor function to get a component.
d ## "2017-11-28"
day(d) ## 28

Assign into an accessor function to change a component in place.
day(d) <- 1
d ## "2017-11-01"

2018-01-31 11:59:59 — **date**(x) Date component. date(dt)

2018-01-31 11:59:59 — **year**(x) Year. year(dt)
isoyear(x) The ISO 8601 year.
epiyear(x) Epidemiological year.

2018-01-31 11:59:59 — **month**(x, label, abbr) Month. month(dt)

day_in_month()

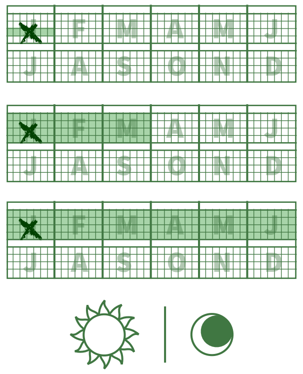
2018-01-31 11:59:59 — **day**(x) Day of month. day(dt)
wday(x, label, abbr) Day of week.
qday(x) Day of quarter.

2018-01-31 11:59:59 — **hour**(x) Hour. hour(dt)

2018-01-31 11:59:59 — **minute**(x) Minutes. minute(dt)

2018-01-31 11:59:59 — **second**(x) Seconds. second(dt)

2018-01-31 11:59:59 UTC — **tz**(x) Time zone. tz(dt)



week(x) Week of the year. week(dt)
isoweek() ISO 8601 week.
epiweek() Epidemiological week.

quarter(x) Quarter. quarter(dt)

semester(x, with_year = FALSE) Semester. semester(dt)

am(x) Is it in the am? am(dt)
pm(x) Is it in the pm? pm(dt)

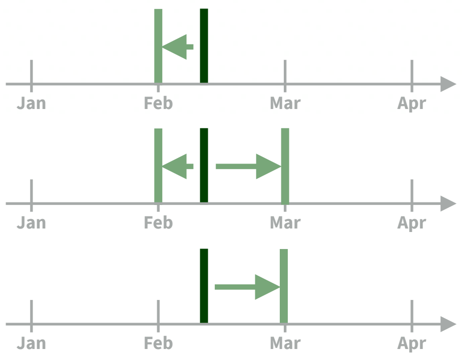
dst(x) Is it daylight savings? dst(d)

leap_year(x) Is it a leap year? leap_year(d)

update(object, ..., simple = FALSE) update(dt, mday = 2, hour = 1)

Round Date-times

round years: 5 * (year(date) %/% 5)



floor_date(x, unit = "second") Round down to nearest unit. floor_date(dt, unit = "month")

round_date(x, unit = "second") Round to nearest unit. round_date(dt, unit = "month")

ceiling_date(x, unit = "second", change_on_boundary = NULL) Round up to nearest unit. ceiling_date(dt, unit = "month")

Valid units are second, minute, hour, day, week, month, bimonth, quarter, season, halfyear and year.

rollback(dates, roll_to_first = FALSE, preserve_hms = TRUE) Roll back to last day of previous month. Also **rollforward()**. rollback(dt)

Stamp Date-times

stamp() Derive a template from an example string and return a new function that will apply the template to date-times. Also **stamp_date()** and **stamp_time()**.

1. Derive a template, create a function
   sf <- stamp("Created Sunday, Jan 17, 1999 3:34")
2. Apply the template to dates
   sf(ymd("2010-04-05"))
   ## [1] "Created Monday, Apr 05, 2010 00:00"

Tip: use a date with day > 12

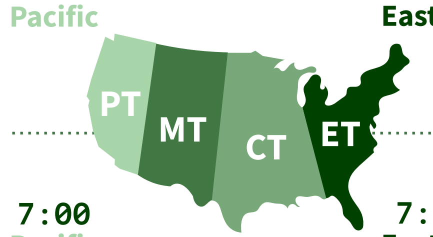
Time Zones

R recognizes ~600 time zones. Each encodes the time zone, Daylight Savings Time, and historical calendar variations for an area. R assigns *one* time zone per vector.

Use the **UTC** time zone to avoid Daylight Savings.

OlsonNames() Returns a list of valid time zone names. OlsonNames()

Sys.timezone() Gets current time zone.



with_tz(time, tzone = "") Get the **same date-time** in a new time zone (a new clock time). Also **local_time**(dt, tz, units). with_tz(dt, "US/Pacific")

force_tz(time, tzone = "") Get the **same clock time** in a new time zone (a new date-time). Also **force_tzs()**. force_tz(dt, "US/Pacific")

RStudio

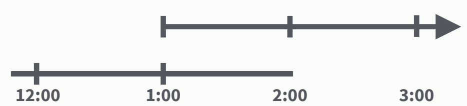
Math with Date-times — Lubridate provides three classes of timespans to facilitate math with dates and date-times.

Math with date-times relies on the **timeline**, which behaves inconsistently. Consider how the timeline behaves during:

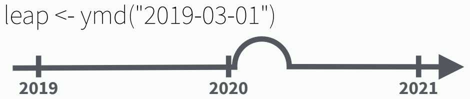
A normal day
nor <- ymd_hms("2018-01-01 01:30:00",tz="US/Eastern")

The start of daylight savings (spring forward)
gap <- ymd_hms("2018-03-11 01:30:00",tz="US/Eastern")

The end of daylight savings (fall back)
lap <- ymd_hms("2018-11-04 00:30:00",tz="US/Eastern")

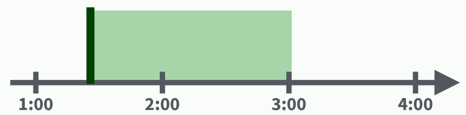


Leap years and leap seconds
leap <- ymd("2019-03-01")

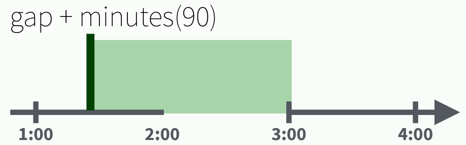


Periods track changes in clock times, which ignore time line irregularities.

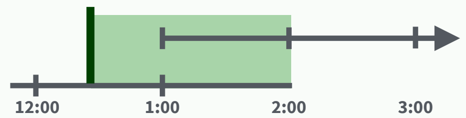
nor + minutes(90)



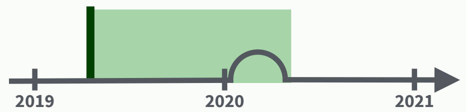
gap + minutes(90)



lap + minutes(90)

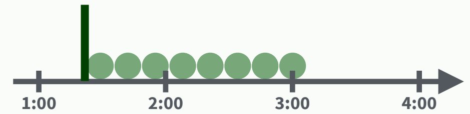


leap + years(1)

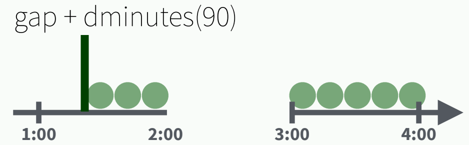


Durations track the passage of physical time, which deviates from clock time when irregularities occur.

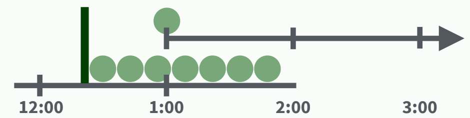
nor + dminutes(90)



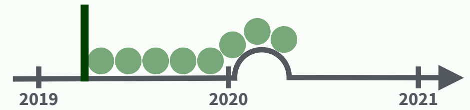
gap + dminutes(90)



lap + dminutes(90)

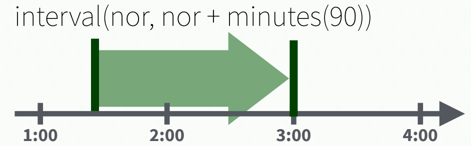


leap + dyears(1)

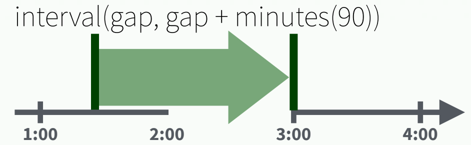


Intervals represent specific intervals of the timeline, bounded by start and end date-times.

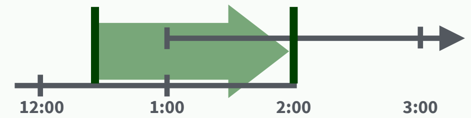
interval(nor, nor + minutes(90))



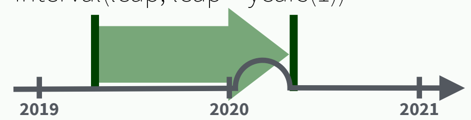
interval(gap, gap + minutes(90))



interval(lap, lap + minutes(90))



interval(leap, leap + years(1))



lubridate

Not all years are 365 days due to **leap days**.

Not all minutes are 60 seconds due to **leap seconds**.

It is possible to create an imaginary date by adding **months**, e.g. February 31st

```
jan31 <- ymd(20180131)
jan31 + months(1)
## NA
```

%m+% and **%m-%** will roll imaginary dates to the last day of the previous month.

```
jan31 %m+% months(1)
## "2018-02-28"
```

add_with_rollback(e1, e2, roll_to_first = TRUE) will roll imaginary dates to the first day of the new month.

```
add_with_rollback(jan31, months(1),
roll_to_first = TRUE)
## "2018-03-01"
```

PERIODS

Add or subtract periods to model events that happen at specific clock times, like the NYSE opening bell.

Make a period with the name of a time unit ***pluralized***, e.g.

```
p <- months(3) + days(12)
p
"3m 12d 0H 0M 0S"
```

Number of months | Number of days | etc.

```
add_with_rollback(e1, e2,
 roll_to_first = FALSE,
 preserve_hms = TRUE)
```

years(x = 1) x years.
months(x) x months.
weeks(x = 1) x weeks.
days(x = 1) x days.
hours(x = 1) x hours.
minutes(x = 1) x minutes.
seconds(x = 1) x seconds.
milliseconds(x = 1) x milliseconds.
microseconds(x = 1) x microseconds
nanoseconds(x = 1) x nanoseconds.
picoseconds(x = 1) x picoseconds.

period(num = NULL, units = "second", ...) An automation friendly period constructor. period(5, unit = "years")

as.period(x, unit) Coerce a timespan to a period, optionally in the specified units. Also **is.period()**. as.period(i)

period_to_seconds(x) Convert a period to the "standard" number of seconds implied by the period. Also **seconds_to_period()**. period_to_seconds(p)

DURATIONS

Add or subtract durations to model physical processes, like battery life. Durations are stored as seconds, the only time unit with a consistent length. **Difftimes** are a class of durations found in base R.

Make a duration with the name of a period prefixed with a ***d***, e.g.

```
dd <- ddays(14)
dd
"1209600s (~2 weeks)"
```

Exact length in seconds | Equivalent in common units

dyears(x = 1) 31536000x seconds.
dmonths(x = 1) 2629800x seconds.
dweeks(x = 1) 604800x seconds.
ddays(x = 1) 86400x seconds.
dhours(x = 1) 3600x seconds.
dminutes(x = 1) 60x seconds.
dseconds(x = 1) x seconds.
dmilliseconds(x = 1) x x 10^{-3} seconds.
dmicroseconds(x = 1) x x 10^{-6} seconds.
dnanoseconds(x = 1) x x 10^{-9} seconds.
dpicoseconds(x = 1) x x 10^{-12} seconds.

duration(num = NULL, units = "second", ...) An automation friendly duration constructor. duration(5, unit = "years")

as.duration(x, ...) Coerce a timespan to a duration. Also **is.duration()**, **is.difftime()**. as.duration(i)

make_difftime(x) Make difftime with the specified number of units. make_difftime(99999)

INTERVALS

Divide an interval by a duration to determine its physical length, divide an interval by a period to determine its implied length in clock time.

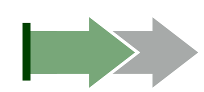
Make an interval with **interval()** or **%--%**, e.g.

Start Date | End Date

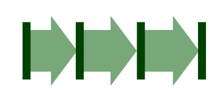
```
i <- interval(ymd("2017-01-01"), d)    ## 2017-01-01 UTC--2017-11-28 UTC
j <- d %--% ymd("2017-12-31")          ## 2017-11-28 UTC--2017-12-31 UTC
```

a **%within%** b Does interval or date-time *a* fall within interval *b*? now() %within% i

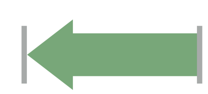
int_start(int) Access/set the start date-time of an interval. Also **int_end()**. int_start(i) <- now(); int_start(i)



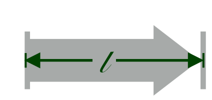
int_aligns(int1, int2) Do two intervals share a boundary? Also **int_overlaps()**. int_aligns(i, j)



int_diff(times) Make the intervals that occur between the date-times in a vector. v <-c(dt, dt + 100, dt + 1000); int_diff(v)



int_flip(int) Reverse the direction of an interval. Also **int_standardize()**. int_flip(i)



int_length(int) Length in seconds. int_length(i)

int_shift(int, by) Shifts an interval up or down the timeline by a timespan. int_shift(i, days(-1))

```
# Exact age
time_length(int, "year")
# Age at last anniversary
trunc(time_length(int, "year"))
```

as.interval(x, start, ...) Coerce a timespan to an interval with the start date-time. Also **is.interval()**. as.interval(days(1), start = now())

RStudio