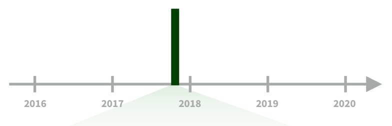
Dates and times with lubridate : : CHEAT SHEET

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 wide variety of input formats.

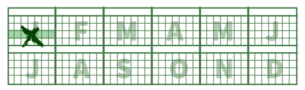
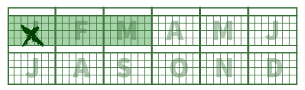
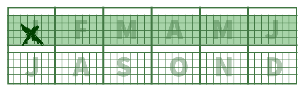
2017-11-28T14:02:00	**ymd_hms**(), **ymd_hm**(), **ymd_h**(). *ymd_hms("2017-11-28T14:02:00")*
2017-22-12 10:00:00	**ydm_hms**(), **ydm_hm**(), **ydm_h**(). *ydm_hms("2017-22-12 10:00:00")*
11/28/2017 1:02:03	**mdy_hms**(), **mdy_hm**(), **mdy_h**(). *mdy_hms("11/28/2017 1:02:03")*
1 Jan 2017 23:59:59	**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")*
2:01	hms::**hms**() Also lubridate::**hms**(), **hm**() and **ms**(), which return periods.* *hms::hms(sec = 0, min= 1, hours = 2)*
2017.5	**date_decimal**(decimal, tz = "UTC") *date_decimal(2017.5)*
	now(tzone = "") Current time in tz (defaults to system tz). *now()*
January	**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")*

GET AND SET COMPONENTS

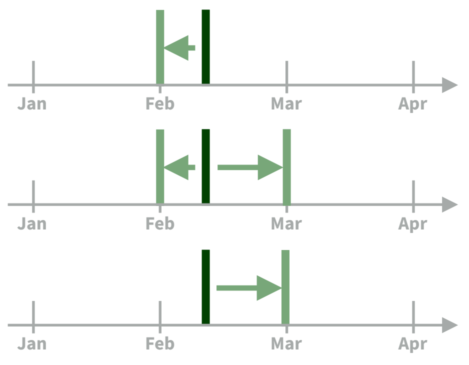
Use an accessor function to get a component.

Assign into an accessor function to change a component in place.

d ## "2017-11-28"
day(d) ## 28
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)*
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)*
	**week**(x) Week of the year. *week(dt)* **isoweek**() ISO 8601 week. **epiweek**() Epidemiological week.
	**quarter**(x, with_year = FALSE) 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



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")*

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

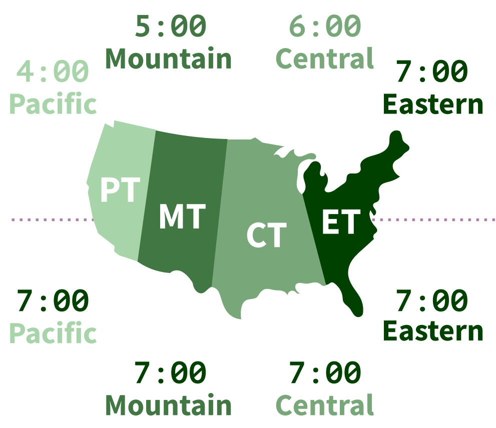
Tip: use a date with day > 12

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()*



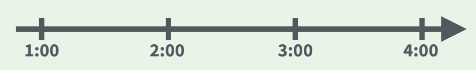
with_tz(time, tzone = "") Get the **same date-time** in a new time zone (a new clock time). *with_tz(dt, "US/Pacific")*

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

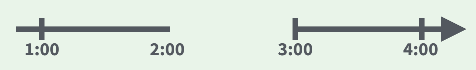
Math with Date-times – Lubridate provides three classes of timespans to facilitate math with dates and date-times

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

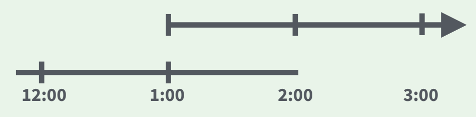
A normal day
nor <- ymd_hms("2018-01-01 01:30:00",tz="US/Eastern")



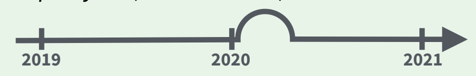
The start of daylight savings (spring forward)
gap <- ymd_hms("2018-03-11 01:30:00",tz="US/Eastern")



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

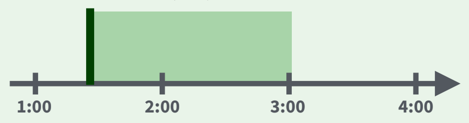


Leap years and leap seconds
leap <- ymd("2019-03-01")

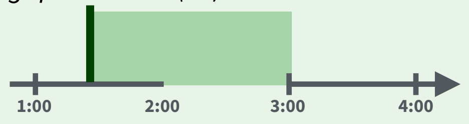


Periods track changes in clock times, which ignore time line irregularities.

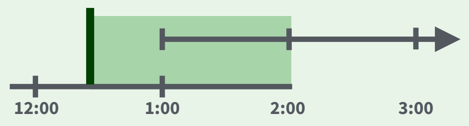
nor + minutes(90)



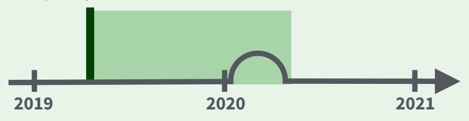
gap + minutes(90)



lap + minutes(90)

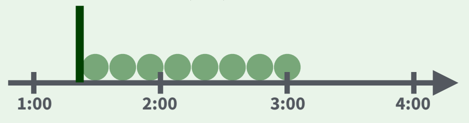


leap + years(1)

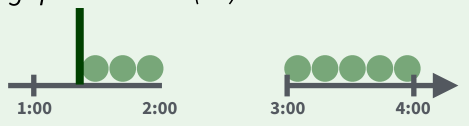


Durations track the passage of physical time, which deviates from clock time when irregularities occur.

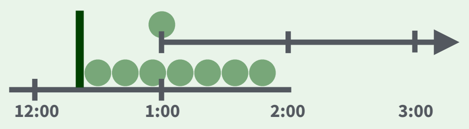
nor + dminutes(90)



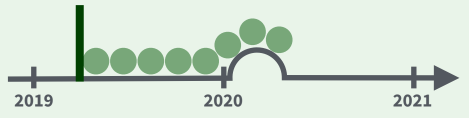
gap + dminutes(90)



lap + dminutes(90)

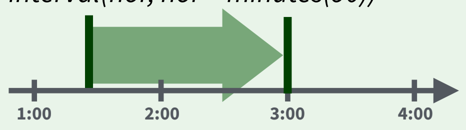


leap + dyears(1)

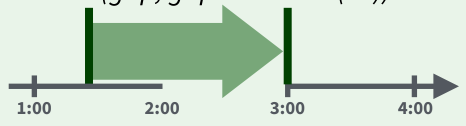


Intervals represent specific intervals of the timeline, bounded by start and end date-times.

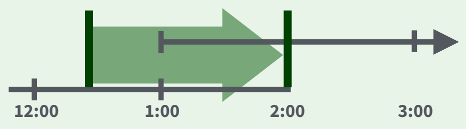
interval(nor, nor + minutes(90))



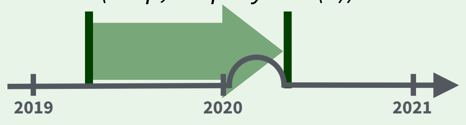
interval(gap, gap + minutes(90))



interval(lap, lap + minutes(90))



interval(leap, leap + years(1))



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.

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.
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 $\times$ 10^{-3} seconds.
dmicroseconds(x = 1) x $\times$ 10^{-6} seconds.
dnanoseconds(x = 1) x $\times$ 10^{-9} seconds.
dpicoseconds(x = 1) x $\times$ 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)*

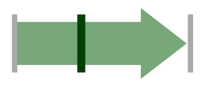
INTERVALS

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

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

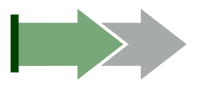
Start Date | End Date

*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*

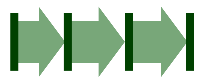


a **%within%** b Does interval or date-time *a* fall within interval *b*? *now() %within% i*

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

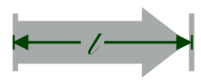


int_aligns(int1, int2) Do two intervals share a boundary? Also **int_overlaps**(). *int_aligns(i, j)*

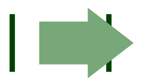


int_diff(times) Make the intervals that occur between the date-times in a vector. *v <-c(dt, dt + 100, dt + 1000); int_diff(v)*

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))*

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