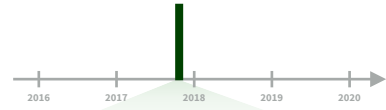


# Dates and times with lubridate : : CHEAT SHEET



## 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"
```

### 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)

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")

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"
```

### 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

2018-01-31 11:59:59

2018-01-31 11:59:59

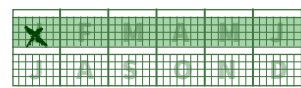
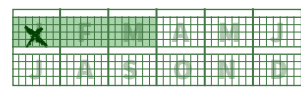
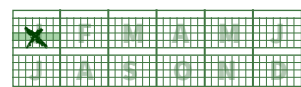
2018-01-31 11:59:59

2018-01-31 11:59:59

2018-01-31 11:59:59

2018-01-31 11:59:59

2018-01-31 11:59:59 UTC



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
```

date(x) Date component. date(dt)

year(x) Year. year(dt)  
isoyear(x) The ISO 8601 year.  
epiyear(x) Epidemiological year.

month(x, label, abbr) Month.  
month(dt)

day(x) Day of month. day(dt)  
wday(x, label, abbr) Day of week.  
qday(x) Day of quarter.

hour(x) Hour. hour(dt)

minute(x) Minutes. minute(dt)

second(x) Seconds. second(dt)

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)

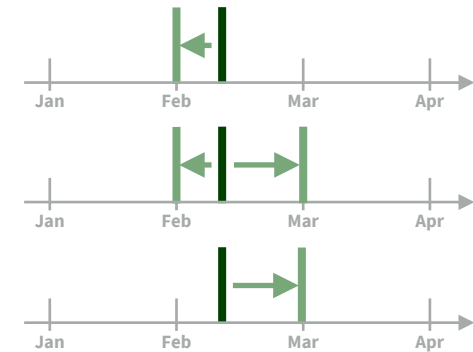
am(x) Is it in the am? am(dt)  
pm(x) Is it in the pm? pm(dt)

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



**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

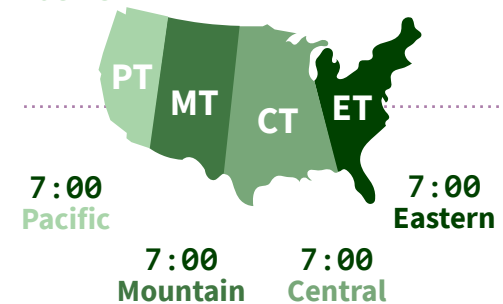
R recognizes ~600 time zones. Each encodes the time zone, Daylight Savings Time, and historical calendar variations for an area. R assigns one time zone per vector.

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.

5:00 Mountain 6:00 Central 7:00 Eastern  
4:00 Pacific



**with\_tz**(time, tzzone = "") Get the **same date-time** in a new time zone (a new clock time).  
with\_tz(dt, "US/Pacific")

**force\_tz**(time, tzzone = "") Get the **same clock time** in a new time zone (a new date-time). Also **force\_tzs**().  
force\_tz(dt, "US/Pacific")

local\_time?

# 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:

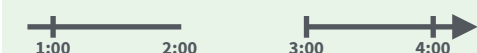
## A normal day

```
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)
```

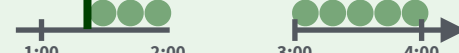


**Durations** track the passage of physical time, which deviates from clock time when irregularities occur.

```
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 = 1)** 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. **Diffimes** 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)**  $x \times 10^{-3}$  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.diffime()**.  
`as.duration(i)`

**make\_diffime(x)** Make diffime with the specified number of units.  
`make_diffime(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.

```
i <- interval(ymd("2017-01-01"), d)
j <- d %--% ymd("2017-12-31")
## 2017-01-01 UTC--2017-11-28 UTC
## 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 timespan to an interval with the start date-time. Also **is.interval()**. `as.interval(days(1), start = now())`