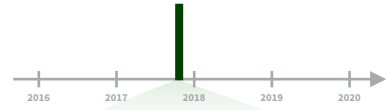


# Dates and times with lubridate : : CHEATSHEET



## 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(seconds = 0, minutes = 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()

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("09-01-01", "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"
```

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
```

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

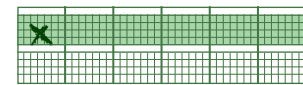
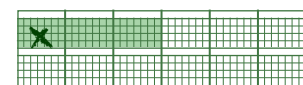
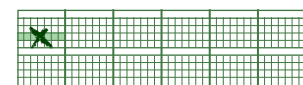
minute(x) Minutes. minute(dt)

2018-01-31 11:59:59

second(x) Seconds. second(dt)

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)

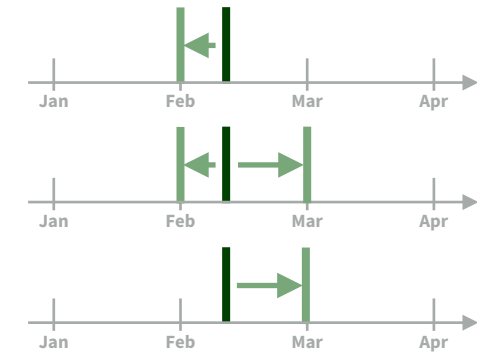
pm(x) Is it in the pm? pm(dt)

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



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, bmonth, 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

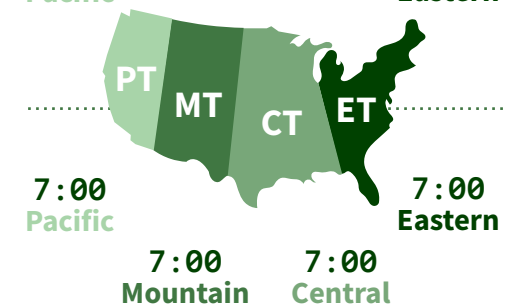
R recognizes ~600 time zones. Each encodes the time zone, Daylight Savings Time, and historical calendar variations for an area. R assigns one time zone per vector.

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.

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



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")

# 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:

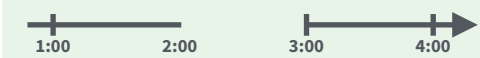
## A normal day

```
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")
```



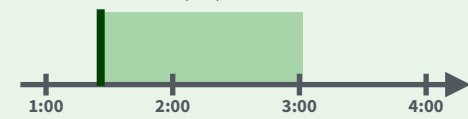
## Leap years and leap seconds

```
leap <- ymd("2019-03-01")
```

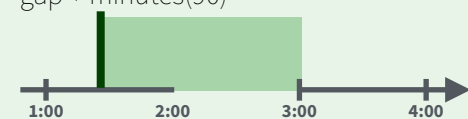


**Periods** track changes in clock times, which ignore time line irregularities.

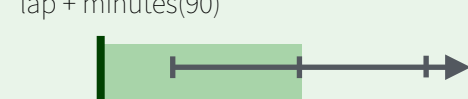
nor + minutes(90)



gap + minutes(90)



lap + minutes(90)

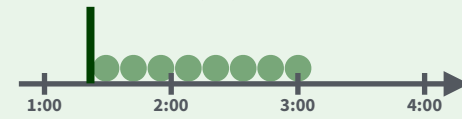


leap + years(1)



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

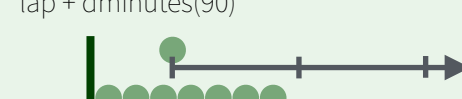
nor + dminutes(90)



gap + dminutes(90)



lap + dminutes(90)

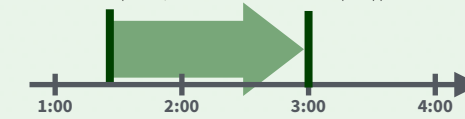


leap + dyears(1)

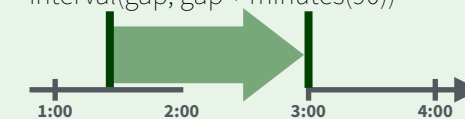


**Intervals** represent specific intervals of the timeline, bounded by start and end date-times.

interval(nor, nor + minutes(90))



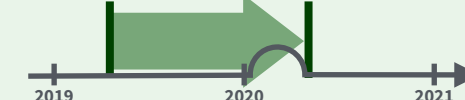
interval(gap, gap + minutes(90))



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(p)

**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
```

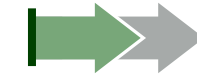
```
## 2017-11-28 UTC--2017-12-31 UTC
```



**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())