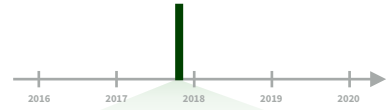


# Dates and times with lubridate : : CHEAT SHEET



## 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 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()
```

```
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"
```

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
```

### 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

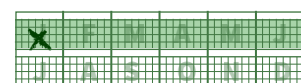
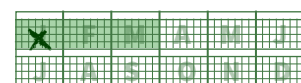
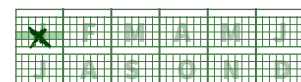
**hour(x)** Hour. *hour(dt)*

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)*

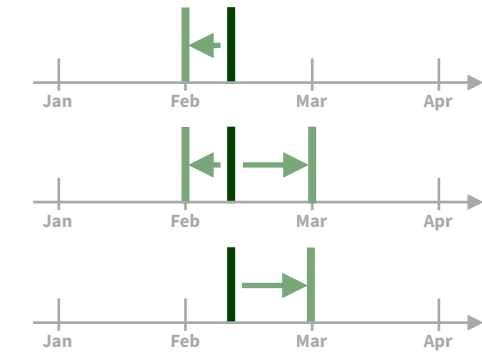
**am(x)** Is it in the am? *am(dt)*  
**pm(x)** Is it in the pm? *pm(dt)*

**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"

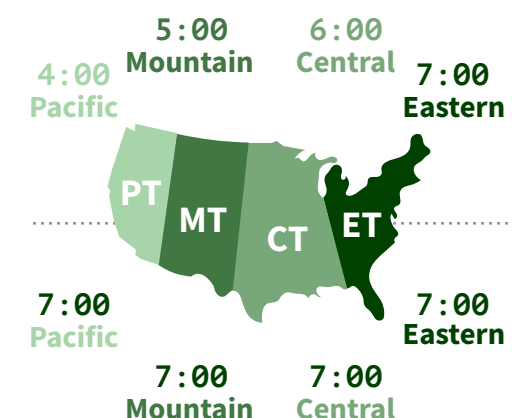
Tip: use a date with day > 12

## 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:

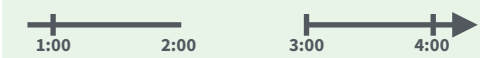
A normal day

```
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")
```



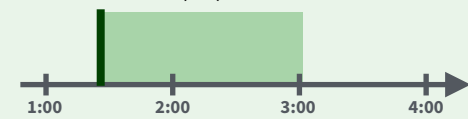
Leap years and leap seconds

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

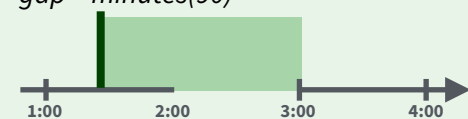


**Periods** track changes in clock times, which ignore time line irregularities.

`nor + minutes(90)`



`gap + minutes(90)`



`lap + minutes(90)`

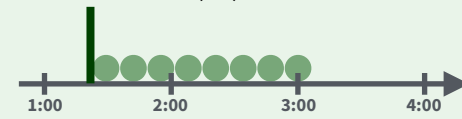


`leap + years(1)`



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

`nor + dminutes(90)`



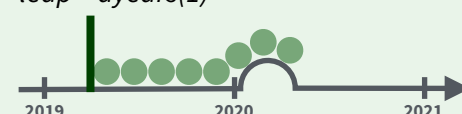
`gap + dminutes(90)`



`lap + dminutes(90)`

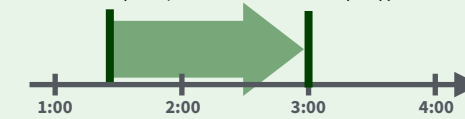


`leap + dyears(1)`

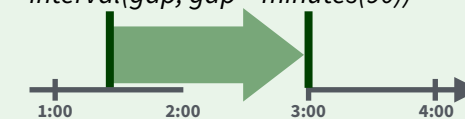


**Intervals** represent specific intervals of the timeline, bounded by start and end date-times.

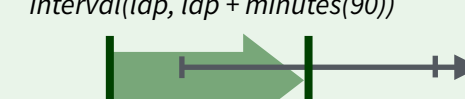
`interval(nor, nor + minutes(90))`



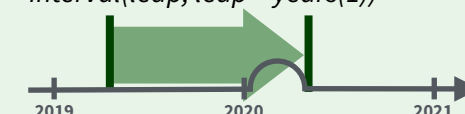
`interval(gap, gap + minutes(90))`



`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 = 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.

**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 × 10<sup>-3</sup> seconds.

**dmicroseconds**(x = 1) x × 10<sup>-6</sup> seconds.

**dnanoseconds**(x = 1) x × 10<sup>-9</sup> seconds.

**dpicoseconds**(x = 1) x × 10<sup>-12</sup> 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) ## 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 timespan to an interval with the start date-time. Also **is.interval()**. `as.interval(days(1), start = now())`