# Data Visualization with ggplot2 : : CHEAT SHEET

## Basics

**ggplot2** is based on the **grammar of graphics**, the idea that you can build every graph from the same components: a **data** set, a **coordinate system**, and geoms—visual marks that represent data points.


To display values, map variables in the data to visual properties of the geom (**aesthetics**) like **size**, **color**, and **x** and **y** locations.


Complete the template below to build a graph.

required

```
ggplot (data = <DATA>) +
<GEOM_FUNCTION>(mapping = aes(<MAPPINGS>),
 stat = <STAT> , position = <POSITION> ) +
<COORDINATE_FUNCTION> +
<FACET_FUNCTION> +
<SCALE_FUNCTION> +
<THEME_FUNCTION>
```

Not required, sensible defaults supplied

**ggplot**(data = mpg, **aes**(x = cty, y = hwy)) Begins a plot that you finish by adding layers to. Add one geom function per layer.

aesthetic mappings | data | geom

**qplot**(x = cty, y = hwy, data = mpg, geom = "point") Creates a complete plot with given data, geom, and mappings. Supplies many useful defaults.

**last_plot**() Returns the last plot

**ggsave("plot.png", width = 5, height = 5)** Saves last plot as 5' x 5' file named "plot.png" in working directory. Matches file type to file extension.

## Geoms

Use a geom function to represent data points, use the geom's aesthetic properties to represent variables. Each function returns a layer.

### GRAPHICAL PRIMITIVES

```
a <- ggplot(economics, aes(date, unemploy))
b <- ggplot(seals, aes(x = long, y = lat))
```

**a + geom_blank()**
(Useful for expanding limits)

**b + geom_curve**(aes(yend = lat + 1, xend=long+1,curvature=z)) - x, xend, y, yend, alpha, angle, color, curvature, linetype, size

**a + geom_path**(lineend="butt", linejoin="round", linemitre=1)
x, y, alpha, color, group, linetype, size

**a + geom_polygon**(aes(group = group))
x, y, alpha, color, fill, group, linetype, size

**b + geom_rect**(aes(xmin = long, ymin=lat, xmax= long + 1, ymax = lat + 1)) - xmax, xmin, ymax, ymin, alpha, color, fill, linetype, size

**a + geom_ribbon**(aes(ymin=unemploy - 900, ymax=unemploy + 900)) - x, ymax, ymin, alpha, color, fill, group, linetype, size

### LINE SEGMENTS

common aesthetics: x, y, alpha, color, linetype, size

**b + geom_abline**(aes(intercept=0, slope=1))
**b + geom_hline**(aes(yintercept = lat))
**b + geom_vline**(aes(xintercept = long))

**b + geom_segment**(aes(yend=lat+1, xend=long+1))
**b + geom_spoke**(aes(angle = 1:1155, radius = 1))

### ONE VARIABLE continuous

```
c <- ggplot(mpg, aes(hwy)); c2 <- ggplot(mpg)
```

**c + geom_area**(**stat = "bin"**)
x, y, alpha, color, fill, linetype, size

**c + geom_density**(kernel = "gaussian")
x, y, alpha, color, fill, group, linetype, size, weight

**c + geom_dotplot()**
x, y, alpha, color, fill

**c + geom_freqpoly()** x, y, alpha, color, group, linetype, size

**c + geom_histogram**(binwidth = 5) x, y, alpha, color, fill, linetype, size, weight

**c2 + geom_qq**(aes(sample = hwy)) x, y, alpha, color, fill, linetype, size, weight

### discrete

```
d <- ggplot(mpg, aes(fl))
```

**d + geom_bar()**
x, alpha, color, fill, linetype, size, weight

### TWO VARIABLES

#### continuous x , continuous y

```
e <- ggplot(mpg, aes(cty, hwy))
```

**e + geom_label**(aes(label = cty), nudge_x = 1, nudge_y = 1, check_overlap = TRUE) x, y, label, alpha, angle, color, family, fontface, hjust, lineheight, size, vjust

**e + geom_jitter**(height = 2, width = 2)
x, y, alpha, color, fill, shape, size

**e + geom_point()**, x, y, alpha, color, fill, shape, size, stroke

**e + geom_quantile()**, x, y, alpha, color, group, linetype, size, weight

**e + geom_rug**(sides = "bl"), x, y, alpha, color, linetype, size

**e + geom_smooth**(method = lm), x, y, alpha, color, fill, group, linetype, size, weight

**e + geom_text**(aes(label = cty), nudge_x = 1, nudge_y = 1, check_overlap = TRUE), x, y, label, alpha, angle, color, family, fontface, hjust, lineheight, size, vjust

#### discrete x , continuous y

```
f <- ggplot(mpg, aes(class, hwy))
```

**f + geom_col**(), x, y, alpha, color, fill, group, linetype, size

**f + geom_boxplot()**, x, y, lower, middle, upper, ymax, ymin, alpha, color, fill, group, linetype, shape, size, weight

**f + geom_dotplot**(binaxis = "y", stackdir = "center"), x, y, alpha, color, fill, group

**f + geom_violin**(scale = "area"), x, y, alpha, color, fill, group, linetype, size, weight

#### discrete x , discrete y

```
g <- ggplot(diamonds, aes(cut, color))
```

**g + geom_count()**, x, y, alpha, color, fill, shape, size, stroke

#### continuous bivariate distribution

```
h <- ggplot(diamonds, aes(carat, price))
```

**h + geom_bin2d**(binwidth = c(0.25, 500))
x, y, alpha, color, fill, linetype, size, weight

**h + geom_density2d()**
x, y, alpha, colour, group, linetype, size

**h + geom_hex()**
x, y, alpha, colour, fill, size

#### continuous function

```
i <- ggplot(economics, aes(date, unemploy))
```

**i + geom_area()**
x, y, alpha, color, fill, linetype, size

**i + geom_line()**
x, y, alpha, color, group, linetype, size

**i + geom_step(direction = "hv")**
x, y, alpha, color, group, linetype, size

#### visualizing error

```
df <- data.frame(grp = c("A", "B"), fit = 4:5, se = 1:2)
j <- ggplot(df, aes(grp, fit, ymin = fit-se, ymax = fit+se))
```

**j + geom_crossbar**(fatten = 2)
x, y, ymax, ymin, alpha, color, fill, group, linetype, size

**j + geom_errorbar()**, x, ymax, ymin, alpha, color, group, linetype, size, width (also **geom_errorbarh()**)

**j + geom_linerange()**
x, ymin, ymax, alpha, color, group, linetype, size

**j + geom_pointrange()**
x, y, ymin, ymax, alpha, color, fill, group, linetype, shape, size

#### maps

```
data <- data.frame(murder = USArrests$Murder,
state = tolower(rownames(USArrests)))
map <- map_data("state")
k <- ggplot(data, aes(fill = murder))
```

**k + geom_map**(aes(map_id = state), map = map)
**+ expand_limits**(x = map$long, y = map$lat),
map_id, alpha, color, fill, linetype, size

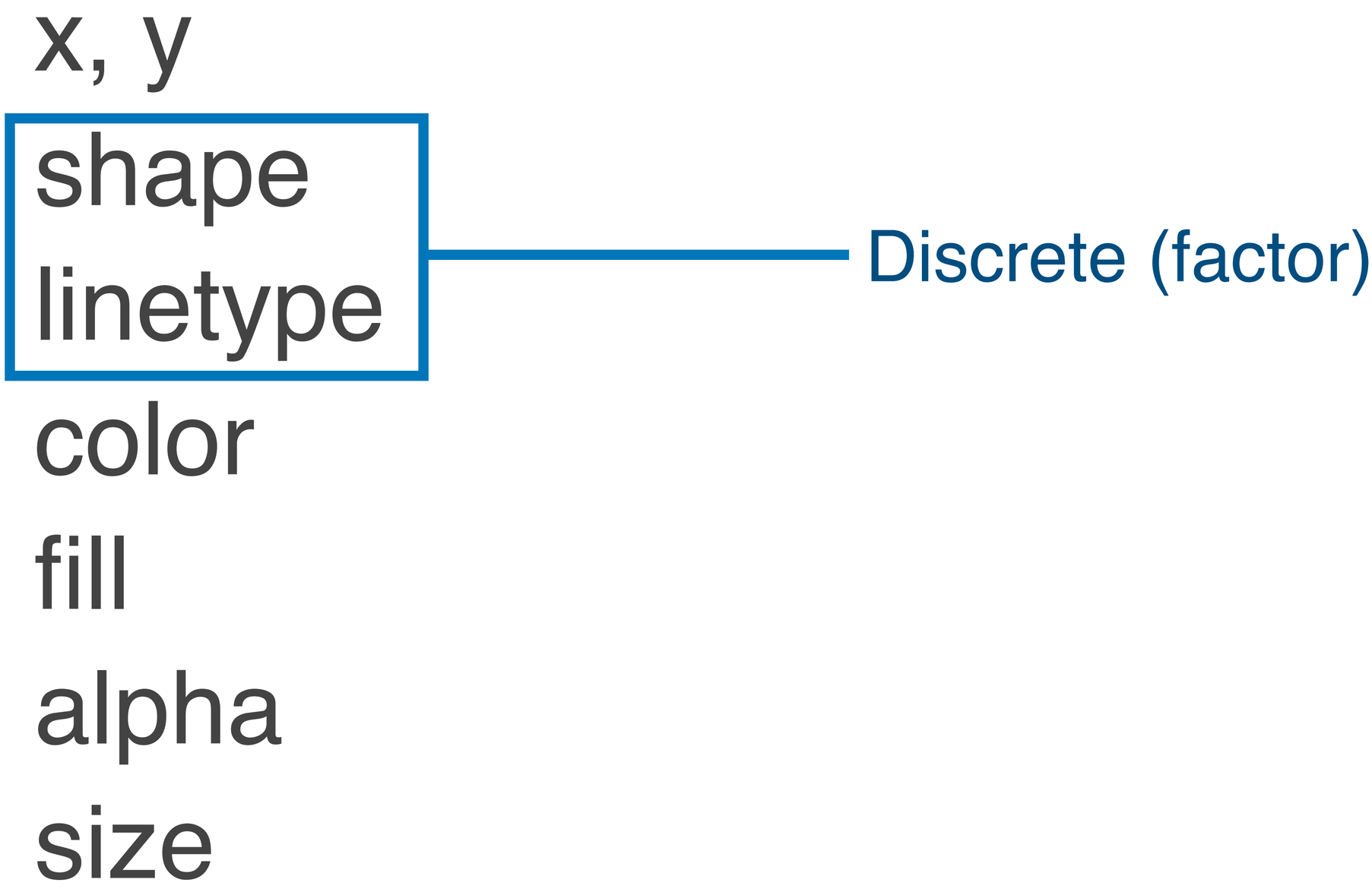
### THREE VARIABLES

```
seals$z <- with(seals, sqrt(delta_long^2 + delta_lat^2))l <- ggplot(seals, aes(long, lat))
```

**l + geom_contour(aes(z = z))**
x, y, z, alpha, colour, group, linetype, size, weight

**l + geom_raster**(aes(fill = z), hjust=0.5, vjust=0.5, interpolate=FALSE)
x, y, alpha, fill

**l + geom_tile**(aes(fill = z)), x, y, alpha, color, fill, linetype, size, width


x, y
shape
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Discrete (factor)