

Data Visualization with ggplot2

Session 2: Building a Custom Theme

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The theme layer

The `theme()` function allows you to override default graphics settings. There are two main components involved:

Elements: non-data elements of the graphic that you can control

Examples:

- `plot.title`
- `axis.ticks.x`
- `legend.key.height`
- etc.

Element functions: the description of element features

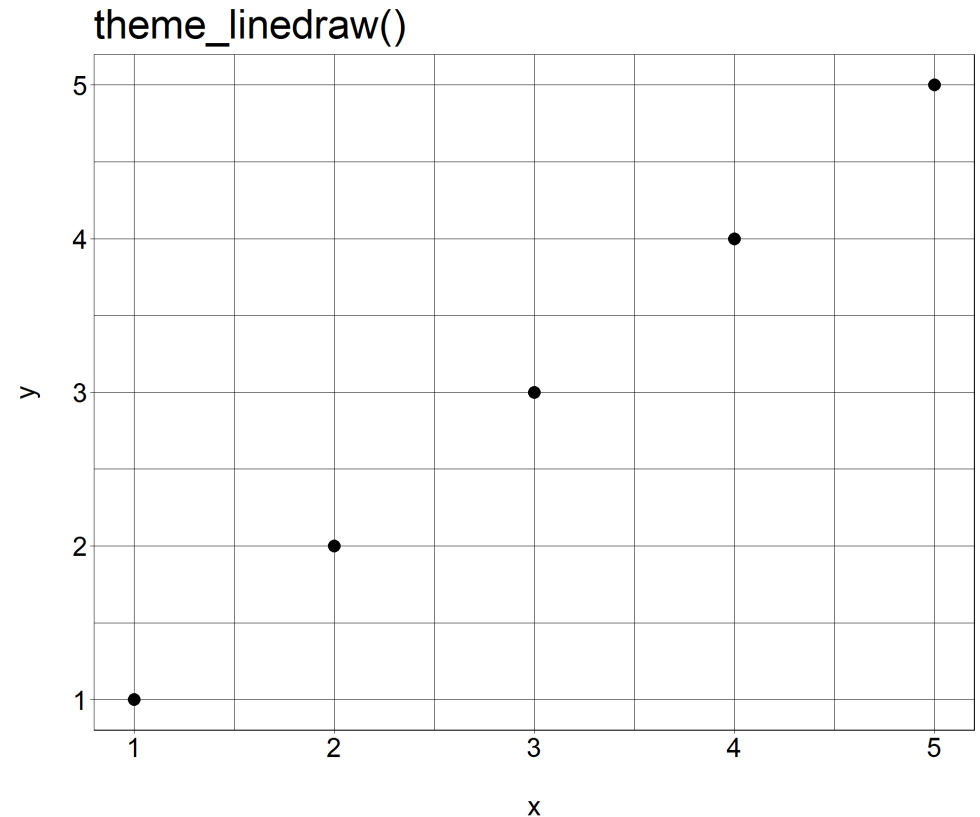
Examples:

- `element_text()`
- `element_rect()`
- `element_line()`
- etc.

Complete themes

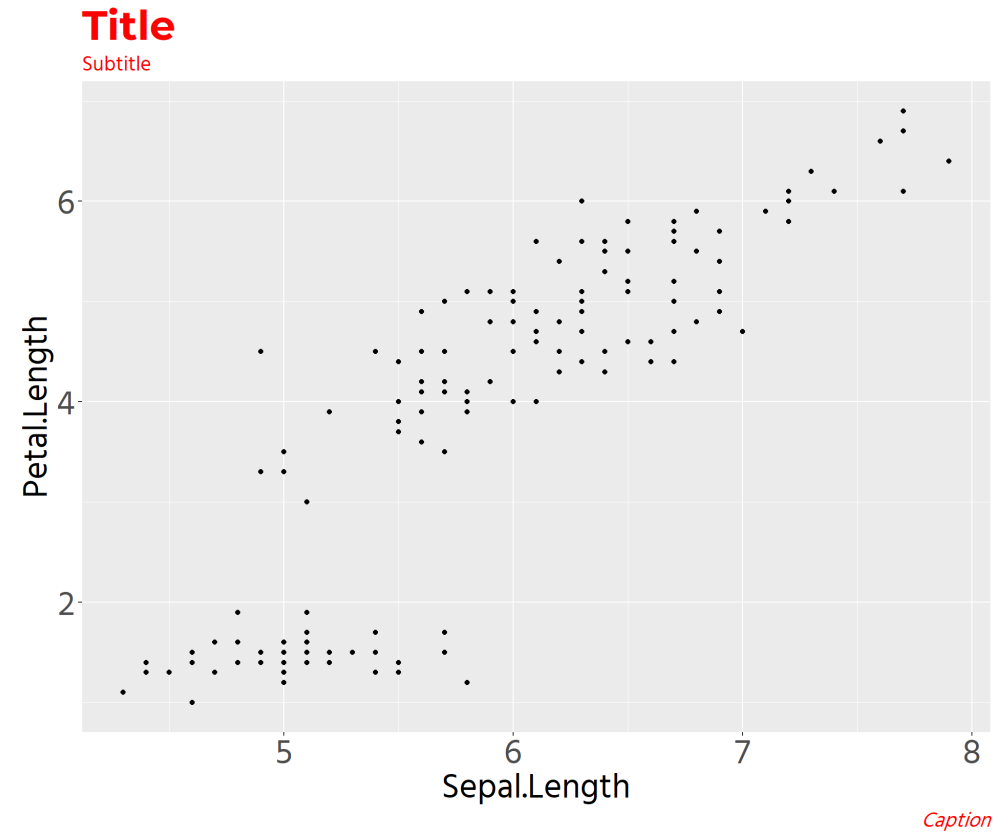
ggplot2 has eight pre-made themes built in:

- `theme_grey()`
 - `theme_bw()`
- `theme_linedraw()`
 - `theme_light()`
 - `theme_dark()`
- `theme_minimal()`
- `theme_classic()`
- `theme_void()`



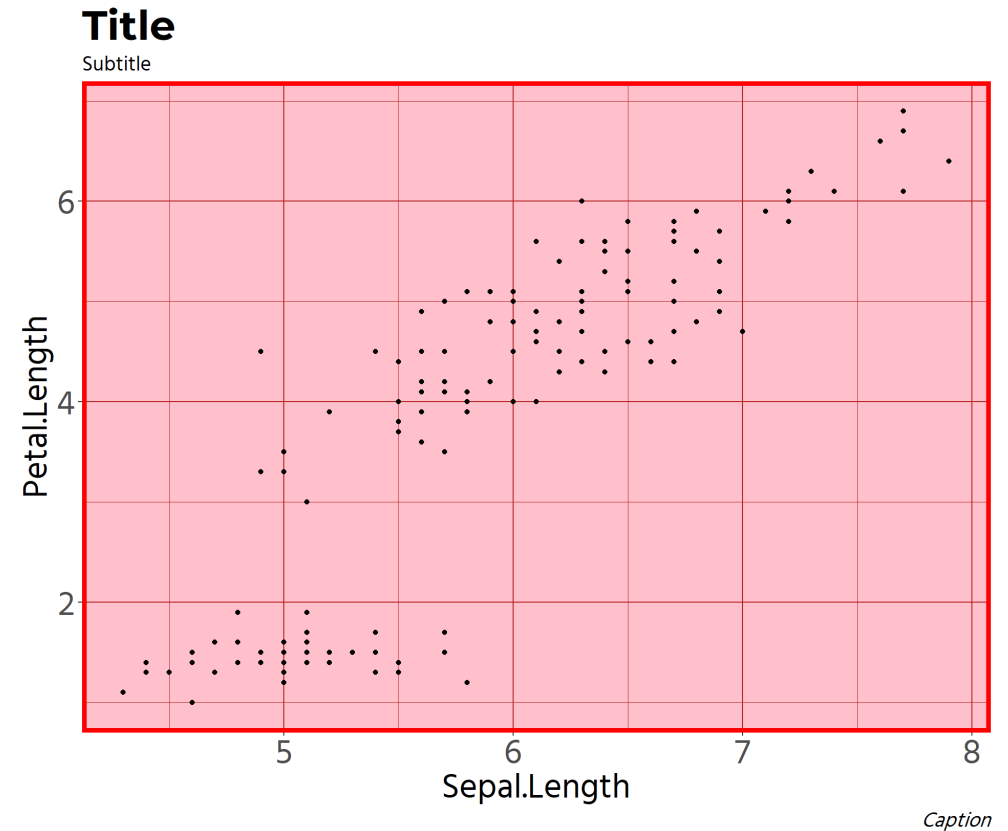
Plot elements

- `plot.background`
- `plot.title`
- `plot.title.position`
- `plot.subtitle`
- `plot.caption`
- `plot.caption.position`
- `plot.tag`
- `plot.tag.position`



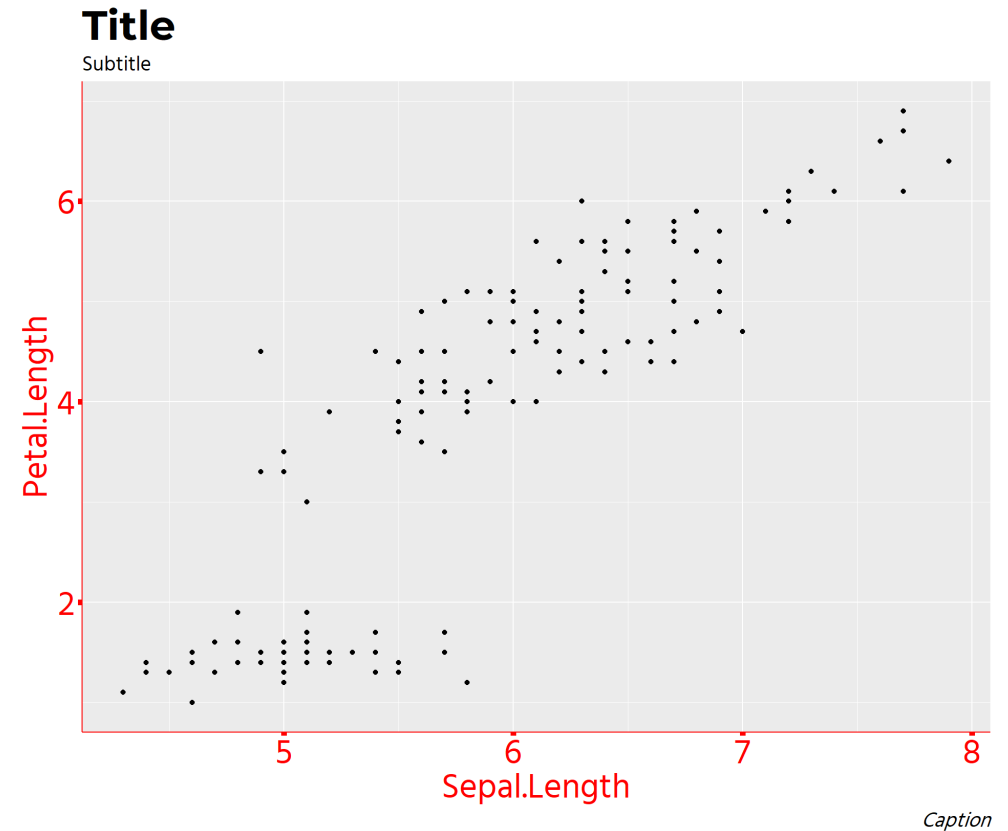
Panel elements

- `panel.background`
- `panel.border`
- `panel.grid`
 - `panel.grid.major`
 - `panel.grid.major.x`
 - `panel.grid.major.y`
 - `panel.grid.minor`
 - `panel.grid.minor.x`
 - `panel.grid.minor.y`



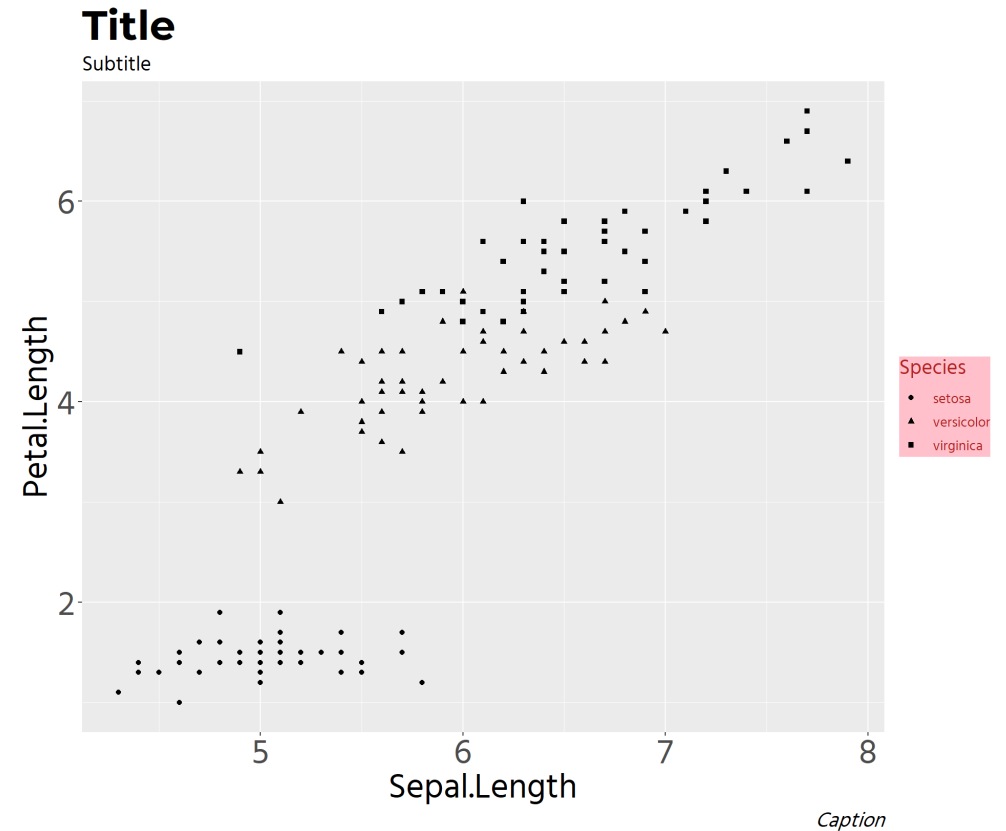
Axis elements

- `axis.title`
 - `axis.title.x` (.top/.bottom)
 - `axis.title.y` (.left/.right)
- `axis.text`
 - `axis.text.x` (.top/.bottom)
 - `axis.text.y` (.left/.right)
- `axis.ticks`
 - `axis.ticks.x` (.top/.bottom)
 - `axis.ticks.y` (.left/.right)
- `axis.ticks.length`
 - `axis.ticks.length.x` (.top/.bottom)
 - `axis.ticks.length.y` (.left/.right)
- `axis.line`
 - `axis.line.x` (.top/.bottom)
 - `axis.line.y` (.left/.right)



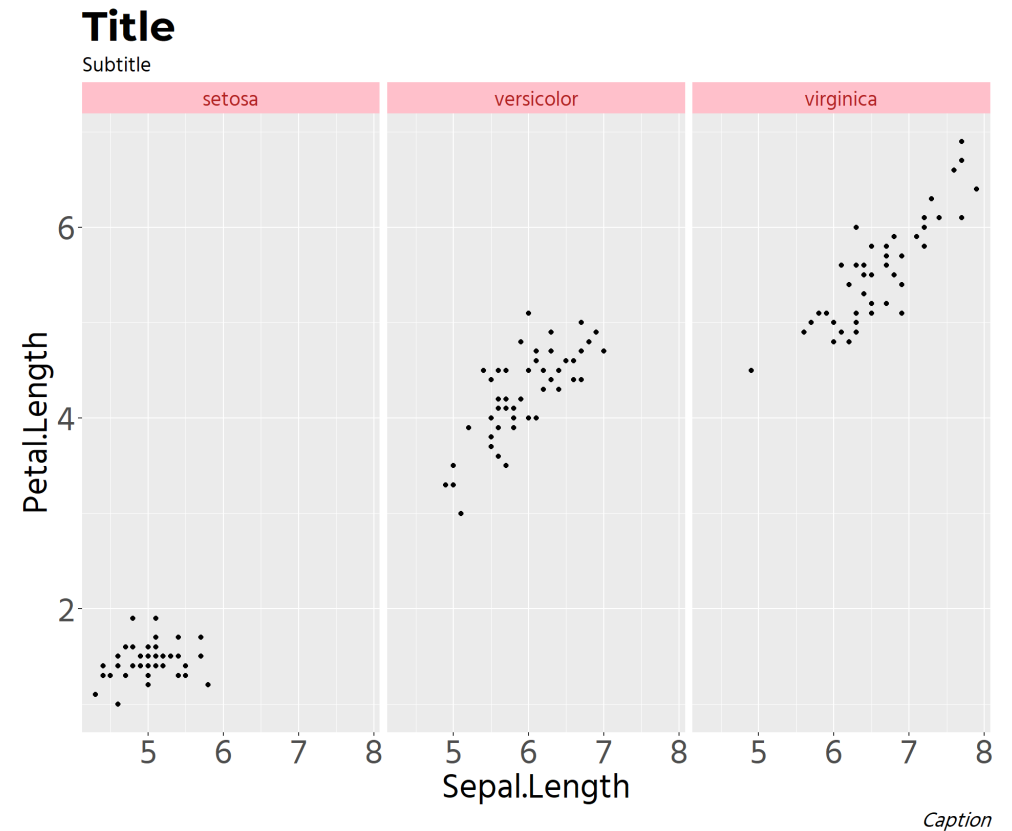
Legend elements

- `legend.background`
- `legend.margin`
- `legend.spacing`
 - `legend.spacing.x`
 - `legend.spacing.y`
- `legend.key`
 - `legend.key.size`
 - `legend.key.height`
 - `legend.key.width`
- `legend.text`
 - `legend.text.align`
- `legend.title`
 - `legend.title.align`
- `legend.position`
- `legend.direction`
- `legend.justification`
- `legend.box`
 - `legend.box.just`
 - `legend.box.margin`
 - `legend.box.background`
 - `legend.box.spacing`



Faceting elements

- `strip.background`
 - `strip.background.x`
 - `strip.background.y`
- `strip.placement`
- `strip.text`
 - `strip.text.x`
 - `strip.text.x.bottom`
 - `strip.text.x.top`
 - `strip.text.y`
 - `strip.text.y.left`
 - `strip.text.y.right`
- `panel.spacing`
 - `panel.spacing.x`
 - `panel.spacing.y`



Colors in R

Colors can be easily referenced in with a hex code, rgb code, or by name (if applicable).

Following colors are available by name:

coral3	deeppink4	gray27	gray87	grey39	grey99	lightpink1	mistyrose1	pink4	slategray1
coral2	deeppink3	gray26	gray86	grey38	grey98	lightpink2	mistyrose2	pink3	slategray2
coral1	deeppink2	gray25	gray85	grey37	grey97	lightgrey	mintcream	pink2	slateblue4
coral	deeppink1	gray24	gray84	grey36	grey96	lightgreen	midnightblue	pink1	slateblue3
chocolate4	deeppink	gray23	gray83	grey35	grey95	lightgray	mediumvioletred	pink	slateblue2
chocolate3	darkviolet	gray22	gray82	grey34	grey94	lightgoldenrod4	mediumturquoise	peru	slateblue1
chocolate2	darkturquoise	gray21	gray81	grey33	grey93	lightgoldenrod3	mediumspringgreen	peachpuff4	slateblue
chocolate1	darkslategrey	gray20	gray80	grey32	grey92	lightgoldenrod2	mediumslateblue	peachpuff3	skyblue4
chocolate	darkslategray4	gray19	gray79	grey31	grey91	lightgoldenrod1	mediumseagreen	peachpuff2	skyblue3
chartreuse4	darkslategray3	gray18	gray78	grey30	grey90	lightgoldenrod	mediumpurple4	peachpuff1	skyblue2
chartreuse3	darkslategray2	gray17	gray77	grey29	grey89	lightcyan4	mediumpurple3	peachpuff	skyblue1
chartreuse2	darkslategray1	gray16	gray76	grey28	grey88	lightcyan3	mediumpurple2	papayawhip	skyblue
chartreuse1	darkslategray	gray15	gray75	grey27	grey87	lightcyan2	mediumpurple1	palevioletred4	sienna4
cadetblue4	darkseagreen4	gray14	gray74	grey26	grey86	lightcyan1	mediumorchid4	palevioletred3	sienna3
cadetblue3	darkseagreen3	gray13	gray73	grey25	grey85	lightcyan	mediumorchid3	palevioletred2	sienna2
cadetblue2	darkseagreen2	gray12	gray72	grey24	grey84	lightcoral	mediumorchid2	palevioletred1	sienna1
cadetblue1	darkseagreen1	gray11	gray71	grey23	grey83	lightblue4	mediumorchid1	paleturquoise4	seashell4
cadetblue	darkseagreen	gray10	gray70	grey22	grey82	lightblue3	mediumorchid	paleturquoise3	seashell3
burlywood4	darksalmon	gray9	gray69	grey21	grey81	lightblue2	mediumblue	paleturquoise2	seashell2
burlywood3	darkred	gray8	gray68	grey20	grey80	lightblue1	mediumaquamarine	paleturquoise1	seashell1
burlywood2	darkorchid3	gray7	gray67	grey19	grey79	lightblue	maroon4	paleturquoise	seashell
burlywood1	darkorchid2	gray6	gray66	grey18	grey78	lemonchiffon4	maroon3	palegreen4	seagreen4
burlywood	darkorchid1	gray5	gray65	grey17	grey77	lemonchiffon3	maroon2	palegreen3	seagreen3
brown4	darkorchid	gray4	gray64	grey16	grey76	lemonchiffon2	maroon1	palegreen2	seagreen2
brown3	darkorange4	gray3	gray63	grey15	grey75	lemonchiffon1	maroon	palegreen1	seagreen1
brown2	darkorange3	gray2	gray62	grey14	grey74	lemonchiffon	magenta4	palegreen	seagreen
brown1	darkorange2	gray1	gray61	grey13	grey73	lawngreen	magenta3	palegoldenrod	sandybrown
brown	darkorange1	gray0	gray60	grey12	grey72	lavenderblush4	magenta2	orchid4	salmon4
blueviolet	darkorange	gray	gray59	grey11	grey71	lavenderblush3	magenta1	orchid3	salmon3
blue4	darkolivegreen4	goldenrod4	gray58	grey10	grey70	lavenderblush2	limegreen	orchid2	salmon2
blue3	darkolivegreen3	goldenrod3	gray57	grey9	grey69	lavenderblush1	lightyellow4	orchid1	salmon1
blue2	darkolivegreen2	goldenrod2	gray56	grey8	grey68	lavender	lightyellow3	orchid	salmon
blue1	darkolivegreen1	goldenrod	gray55	grey7	grey67	khaki4	lightyellow2	orangered4	saddlebrown
blue	darkolivegreen	gold4	gray54	grey6	grey66	khaki3	lightyellow1	orangered3	royalblue4
blanchedalmond	darkolivegreen	gold3	gray53	grey5	grey65	khaki2	lightyellow	orangered2	royalblue3
black	darkmagenta	gold2	gray52	grey4	grey64	khaki1	lightyellow	orangered1	royalblue2
bisque4	darkkhaki	gold1	gray51	grey3	grey63	khaki	lightsteelblue4	orange4	royalblue1
bisque3	darkgray	ghostwhite	gray50	grey2	grey62	ivory4	lightsteelblue3	orange3	royalblue
bisque2	darkgreen	gainsboro	gray49	grey1	grey61	ivory3	lightsteelblue2	orange2	rosybrown4
bisque1	darkgray	forestgreen	gray48	grey0	grey60	ivory2	lightsteelblue1	orange1	rosybrown3
bisque	darkgoldenrod4	floralwhite	gray47	grey	grey59	ivory1	lightslategray	orange	rosybrown2
beige	darkgoldenrod3	firebrick4	gray46	greenyellow	grey58	ivory	lightslategray	olivedrab4	rosybrown1
azure4	darkgoldenrod2	firebrick3	gray45	green4	grey57	indianred4	lightslategray	olivedrab3	red4
azure3	darkgoldenrod1	firebrick2	gray44	green3	grey56	indianred3	lightslategray	olivedrab2	red3
azure2	darkgoldenrod	firebrick1	gray43	green2	grey55	indianred2	lightslategray	olivedrab1	red2
azure1	darkcyan	firebrick	gray42	green1	grey54	indianred1	lightslategray	olivedrab	red1
azure	darkblue	firebrick	gray41	green	grey53	indianred	lightslategray	oldlace	red
aquamarine4	cyan4	dodgerblue4	gray40	gray100	grey52	hotpink4	lightskyblue4	navajowhite4	purple4
aquamarine3	cyan3	dodgerblue3	gray39	gray99	grey51	hotpink3	lightskyblue3	navajowhite3	purple3
aquamarine2	cyan2	dodgerblue2	gray38	gray98	grey50	hotpink2	lightskyblue2	navajowhite2	purple2
aquamarine1	cyan1	dodgerblue1	gray37	gray97	grey49	hotpink1	lightskyblue1	navajowhite1	purple1
aquamarine	cyan	dodgerblue	gray36	gray96	grey48	hotpink	lightskyblue	navajowhite	purple
antiquewhite4	cornsilk4	dimgray	gray35	gray95	grey47	honeydew4	lightsalmon4	moccasin	plum4
antiquewhite3	cornsilk3	dimgray	gray34	gray94	grey46	honeydew3	lightsalmon3	moccasin	plum3
antiquewhite2	cornsilk2	deepskyblue4	gray33	gray93	grey45	honeydew2	lightsalmon2	moccasin	plum2
antiquewhite1	cornsilk1	deepskyblue3	gray32	gray92	grey44	honeydew1	lightsalmon1	moccasin	plum1
antiquewhite	cornsilk	deepskyblue2	gray31	gray91	grey43	honeydew	lightsalmon	moccasin	plum
aliceblue	cornflowerblue	deepskyblue1	gray30	gray90	grey42	lightpink4	lightpink4	mistyrose4	plum
white	coral4	deepskyblue	gray29	gray89	grey41	lightpink3	lightpink3	mistyrose3	plum
			gray28	gray88	grey40	lightpink2	lightpink2	mistyrose2	plum

Fonts in R

You can use any font available on your computer in a `ggplot2` graphic.

For Windows users

```
1 install.packages('extrafont')
2 library('extrafont')
3
4 font_import()
5 # You will be prompted to continue [y/n]
6 # Type 'y' and press enter
7
8 loadfonts(device="win")
```

For Mac users

```
1 install.packages('extrafont')
2 library('extrafont')
3
4 font_import()
5 # You will be prompted to continue [y/n]
6 # Type 'y' and press enter
7
8 loadfonts()
```

Afterwards, you should be able to utilize fonts:

```
1 ggplot() +
2   ... +
3   theme(...
4     ... = element_text(family = "font-name",
5                        face = "type-face-name")
6   )
```

Be sure to know which font families and font faces you have available.

Building a custom theme

Instead of re-using all of your `theme()` code (which can be lengthy), try saving the code as an object. Then, you can add the object to a ggplot.

```
1 # You have a pre-theme plot saved as 'existing_plot'
2 existing_plot <- ggplot() + ...
3
4 # Save your theme settings as an object ('my_theme')
5 my_theme <- theme(plot.title = element_text(...),
6                   ...
7                   ...
8                   )
9
10 # Add your custom theme to the existing plot
11 existing_plot + my_theme
```

Exercise #2