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File GitHub URL: <https://github.com/finnmok/DS5100-2024-06-R/blob/main/exercises/M12/Participation12.Rm>

12.1

```
library(tidyr)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##   filter, lag

## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union
```

```
library(vctrs)
```

```
##
## Attaching package: 'vctrs'

## The following object is masked from 'package:dplyr':
##
##   data_frame
```

```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## v forcats   1.0.0      v readr     2.1.5
## v ggplot2    3.5.1      v stringr  1.5.0
## v lubridate  1.9.3      v tibble   3.2.1
## v purrr      1.0.2
```

```
## -- Conflicts ----- tidyverse_conflicts() --
```

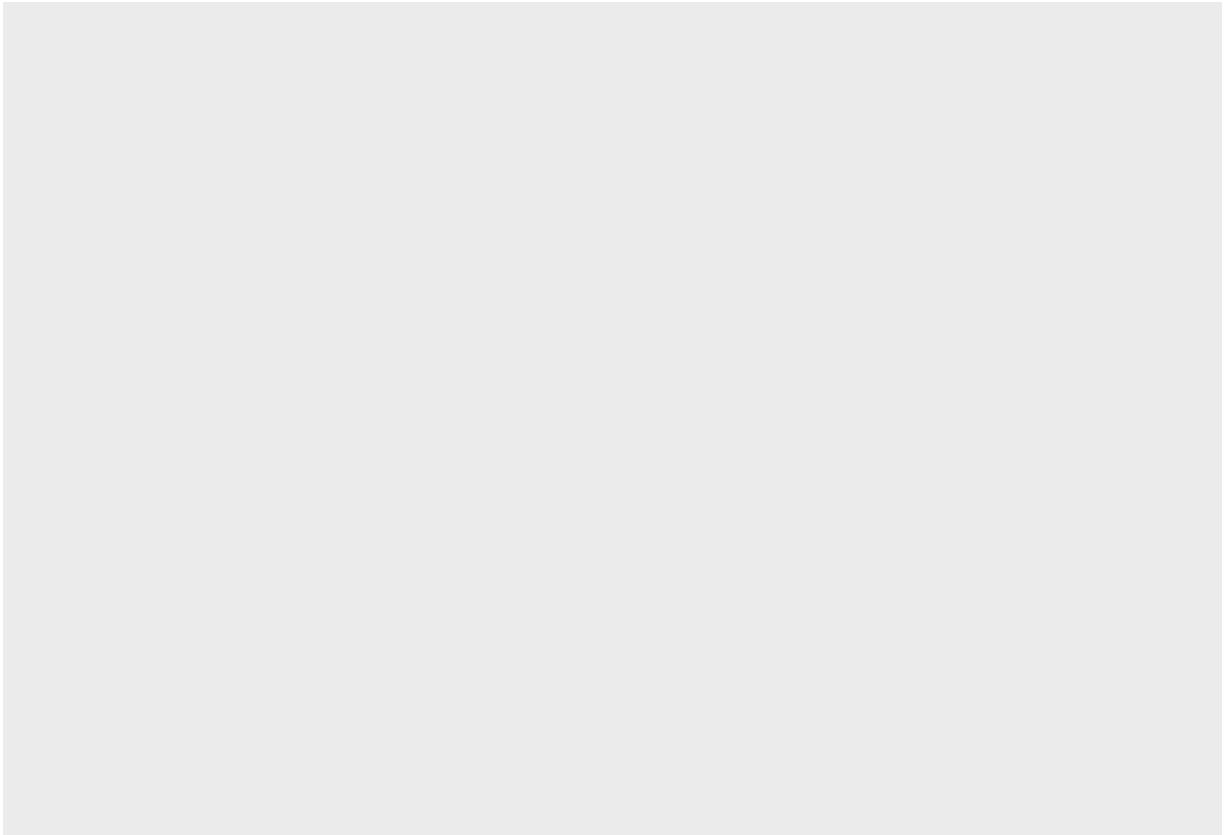
```
## x tibble::data_frame() masks vctrs::data_frame(), dplyr::data_frame()
```

```
## x dplyr::filter()      masks stats::filter()
```

```
## x dplyr::lag()         masks stats::lag()
```

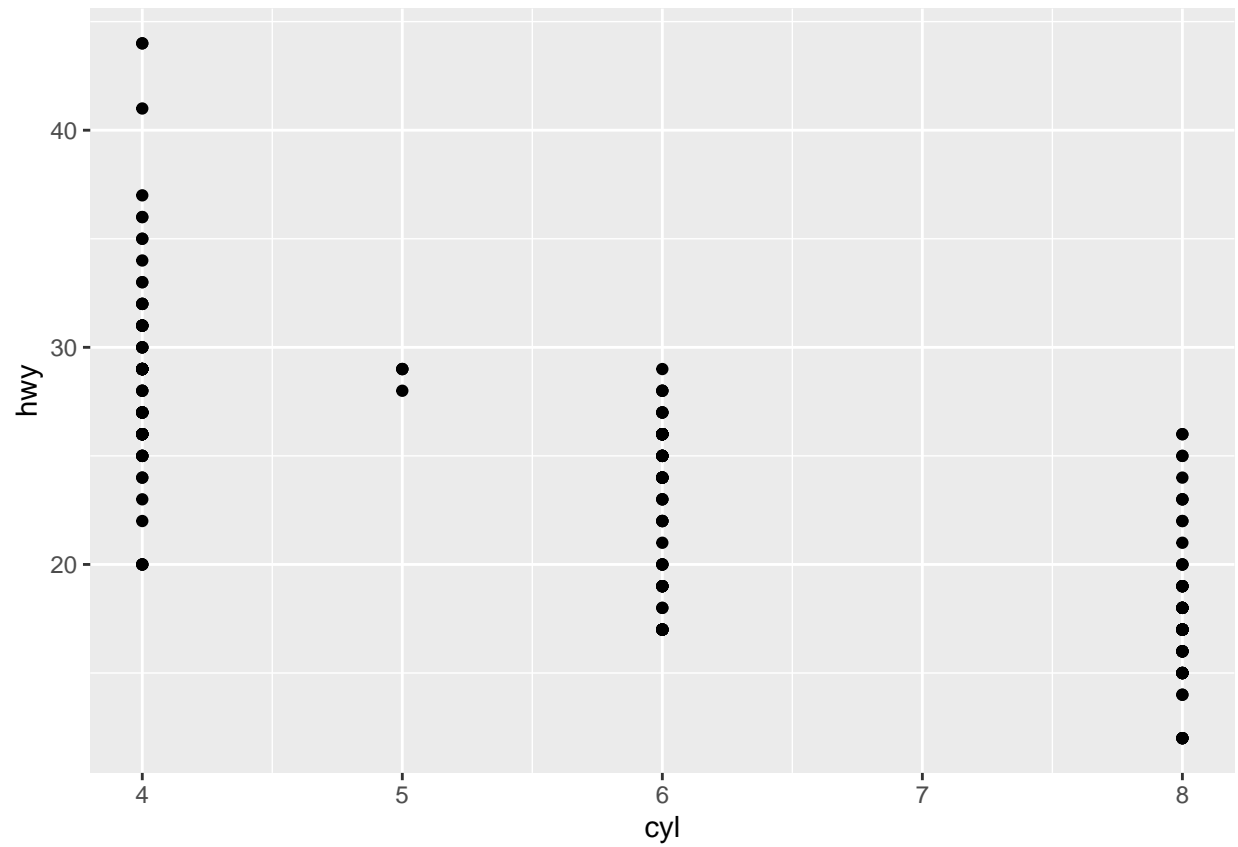
```
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
mpg %>% ggplot()
```



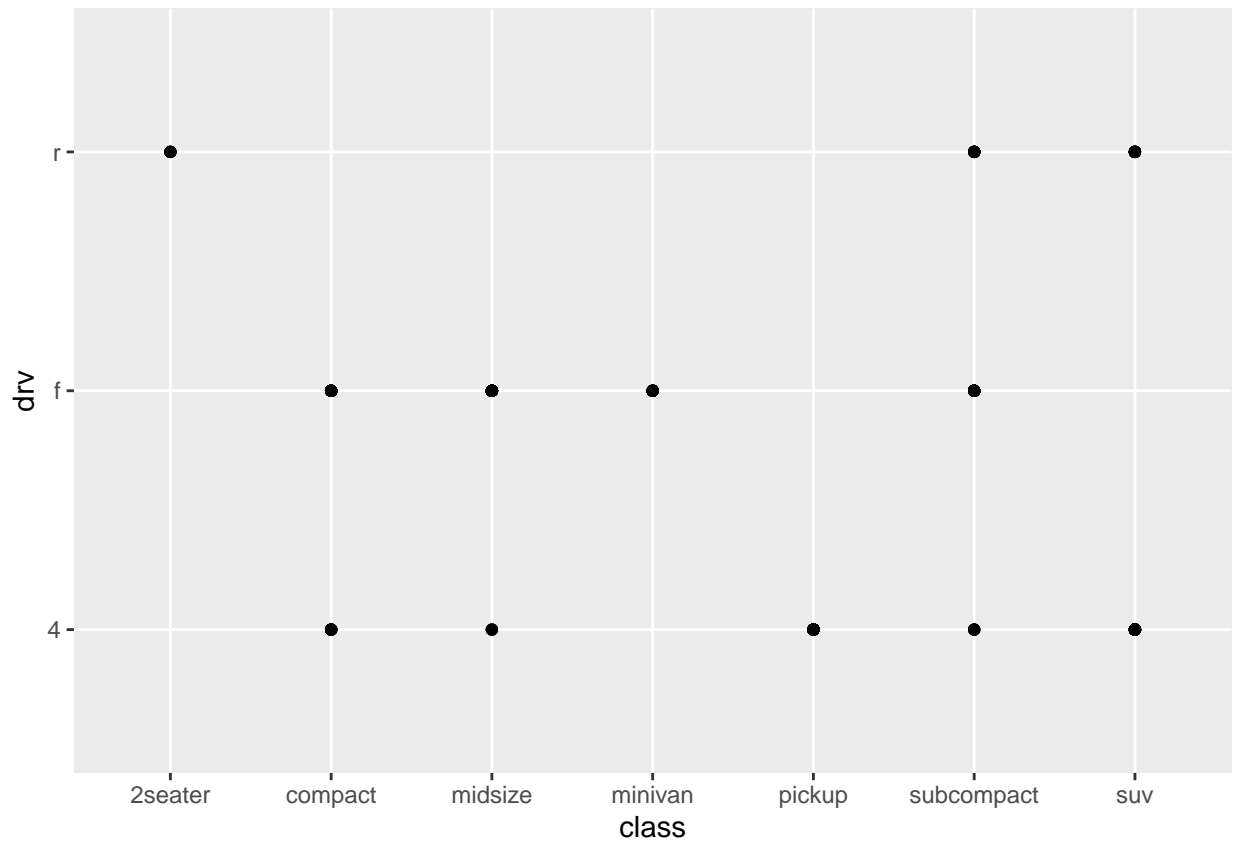
12.2

```
mpg %>% ggplot(aes(x=cyl,y=hwy)) + geom_point()
```



12.3

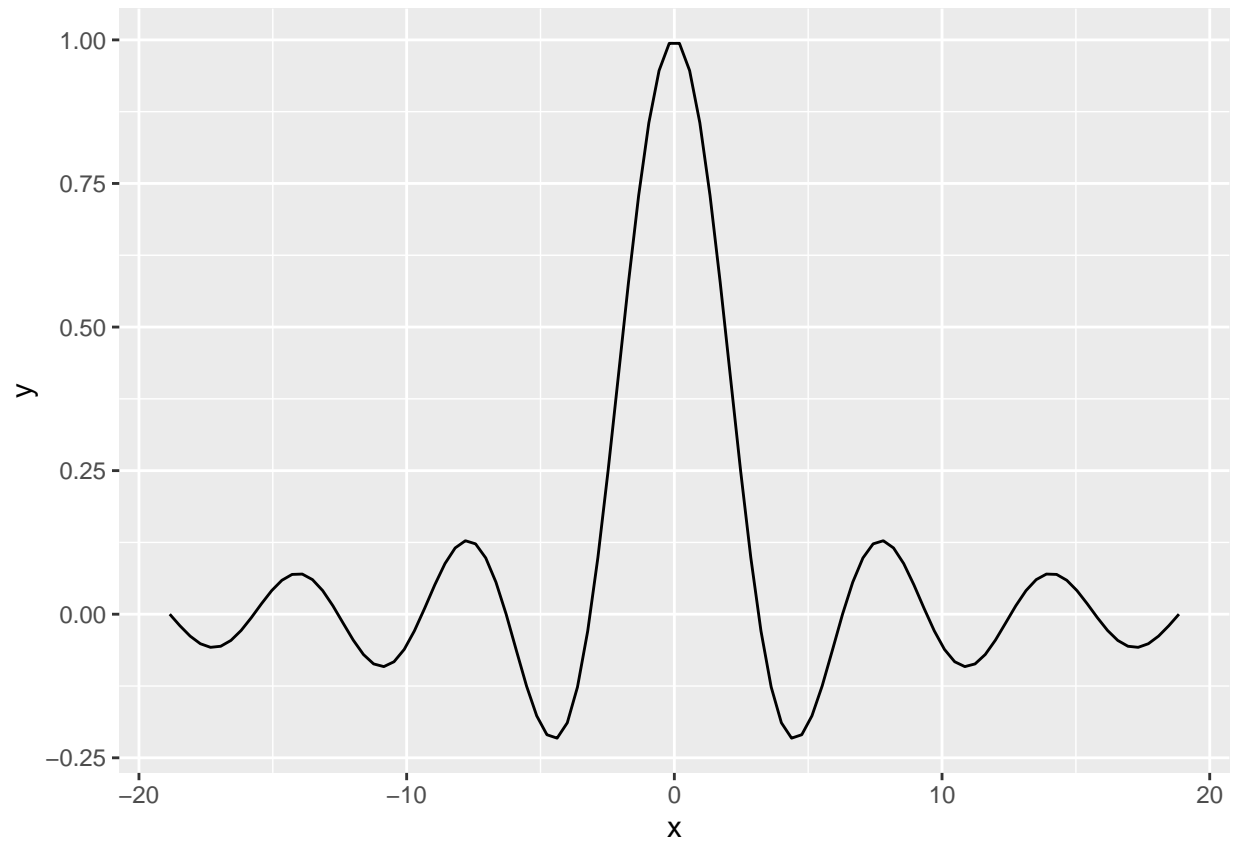
```
mpg %>% ggplot(aes(x=class,y=drv)) + geom_point()
```



The plot is not useful because the values are both categorical. We can know which categories exist, since a dot would fall in a place where both categories line up, but we cannot determine the frequency of these categories since the dots overlap.

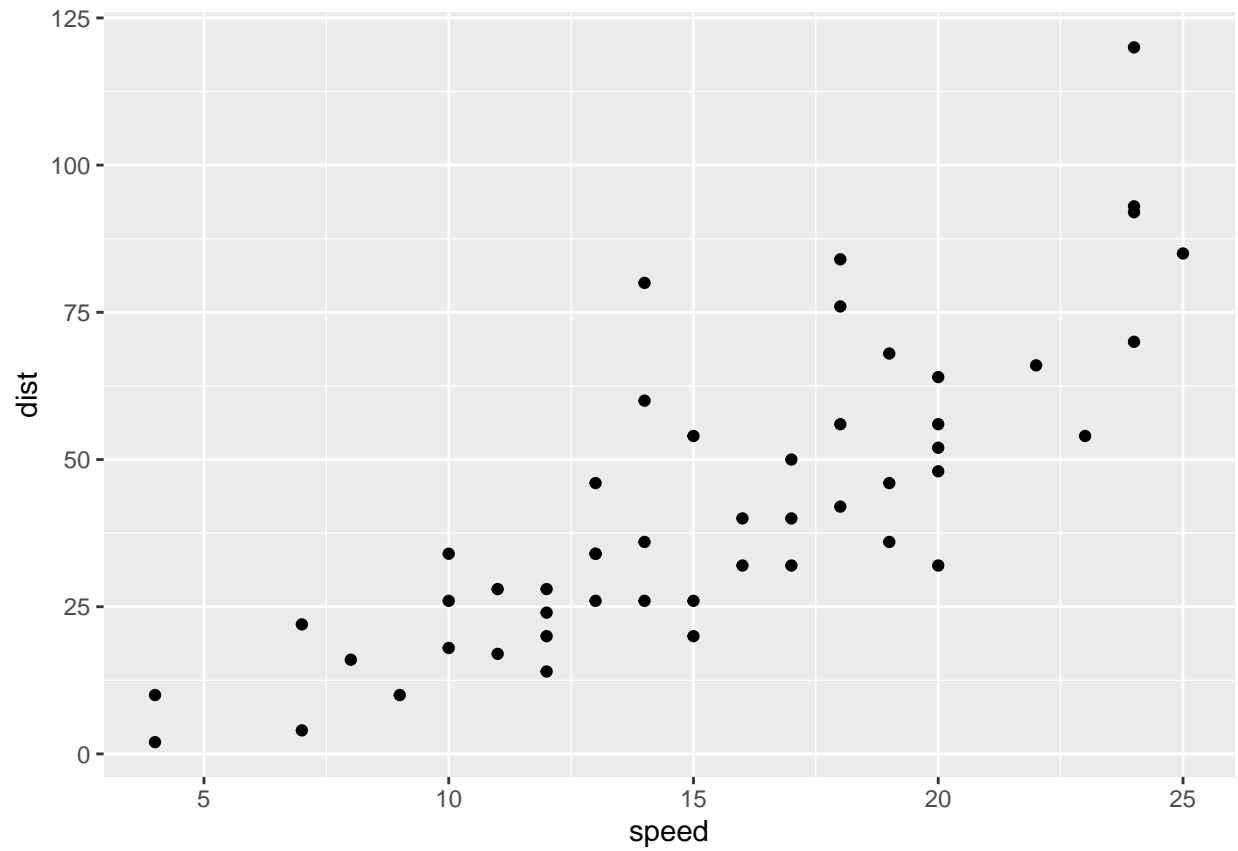
12.4

```
x <- seq(-6*pi,6*pi,length.out = 100)
df <- data.frame(x = x, y = sin(x)/x)
ggplot(df,aes(x=x,y=y)) + geom_line()
```



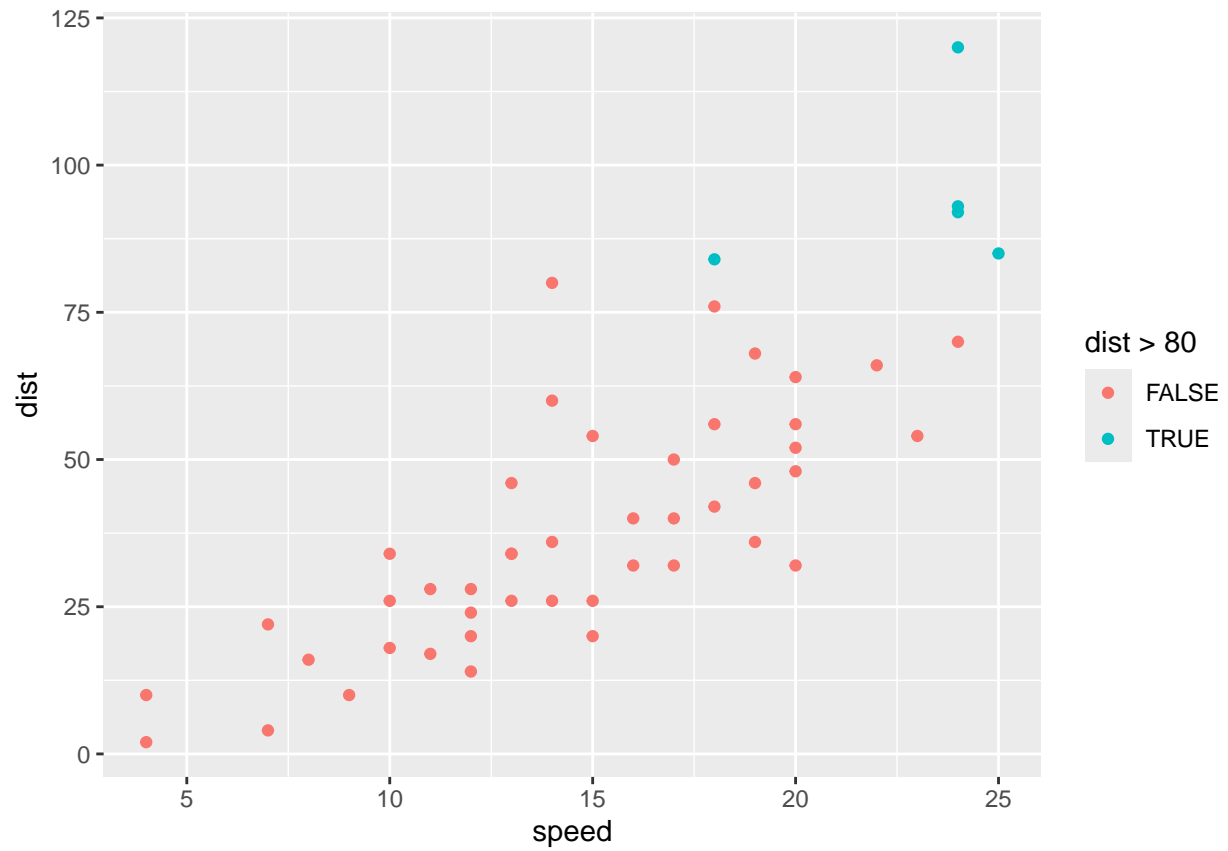
12.5

```
cars %>% ggplot(aes(x=speed,y=dist)) + geom_point()
```



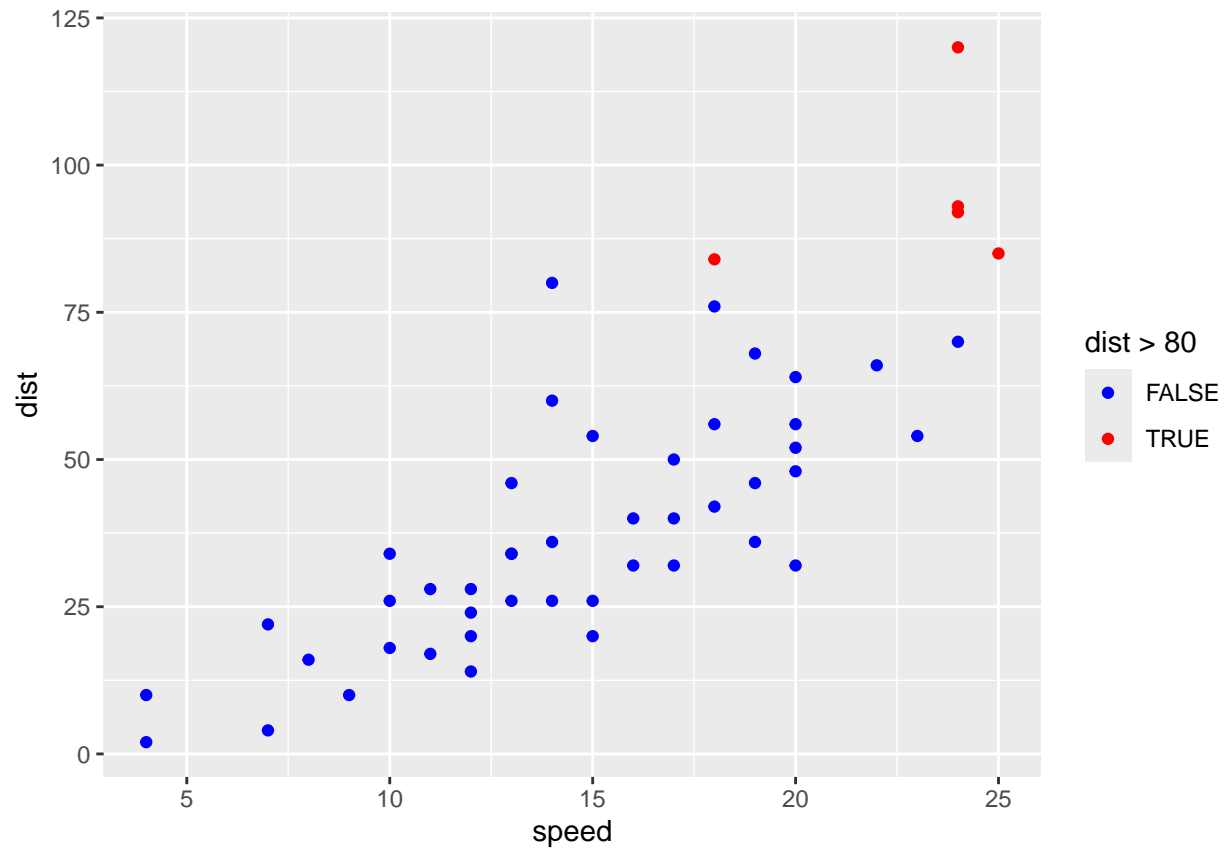
12.6

```
cars %>%  
  ggplot(aes(x=speed,y=dist,color = dist > 80)) + geom_point()
```



12.7

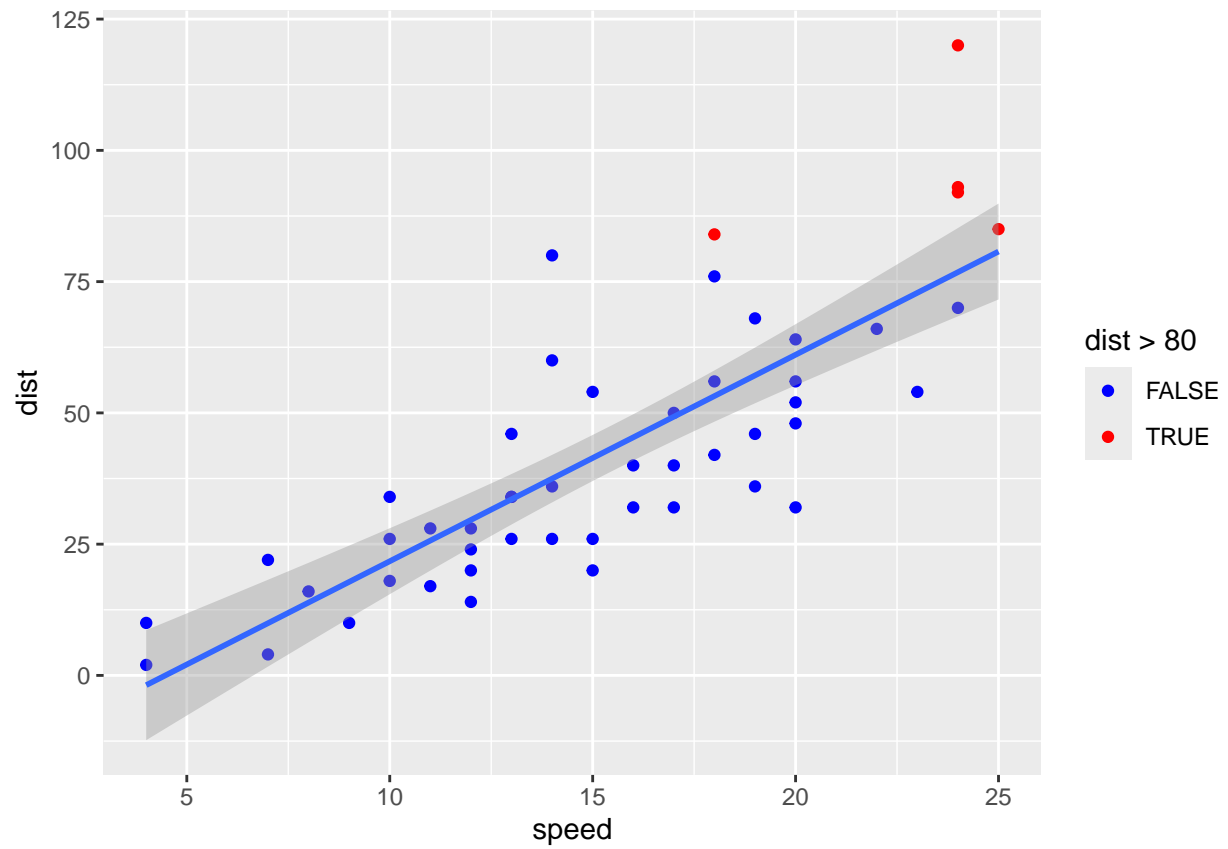
```
cars %>%  
  ggplot(aes(x=speed,y=dist,color = dist > 80)) +  
  geom_point() +  
  scale_color_manual(values=c("blue",'red'))
```



12.8

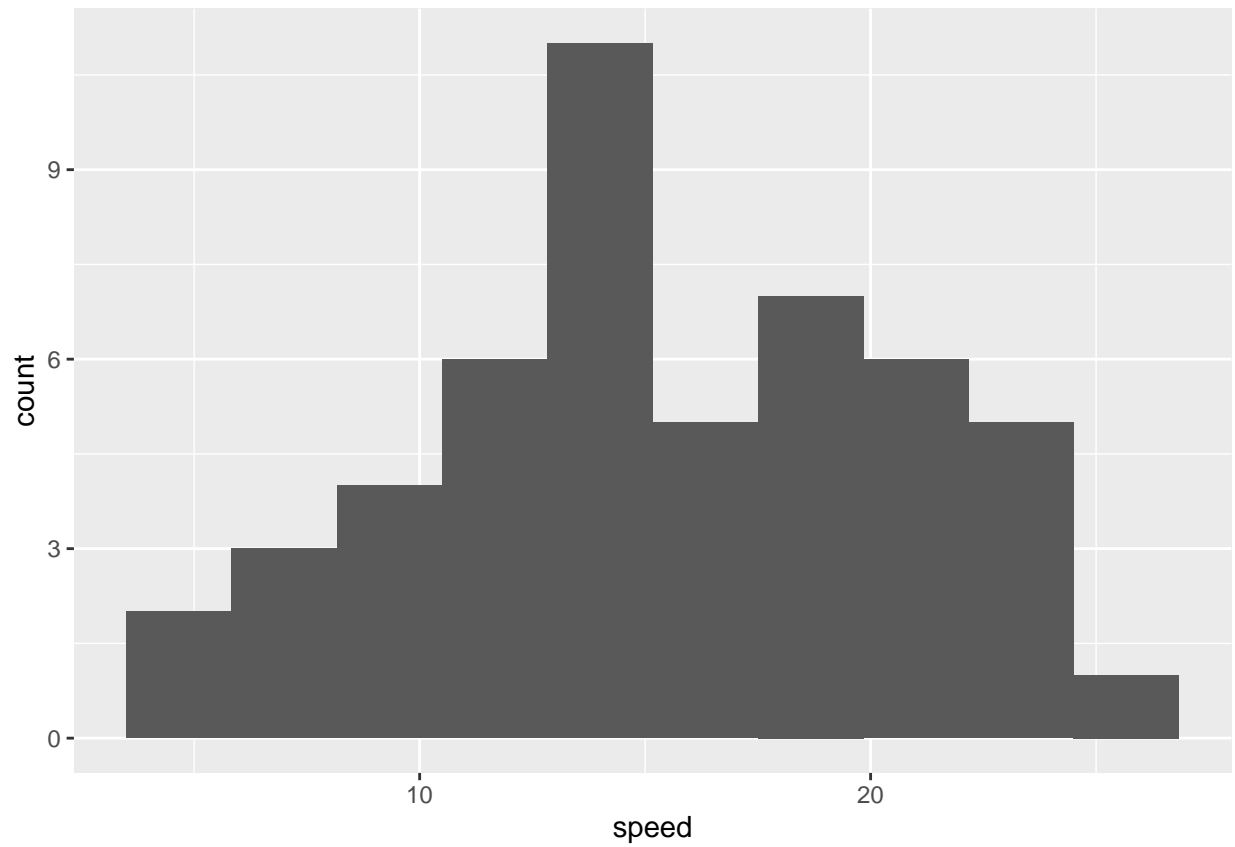
```
cars %>%
  ggplot(aes(x=speed,y=dist)) +
  geom_point(aes(color = dist > 80)) +
  scale_color_manual(values=c("blue",'red')) +
  geom_smooth(method = 'lm')
```

```
## 'geom_smooth()' using formula = 'y ~ x'
```

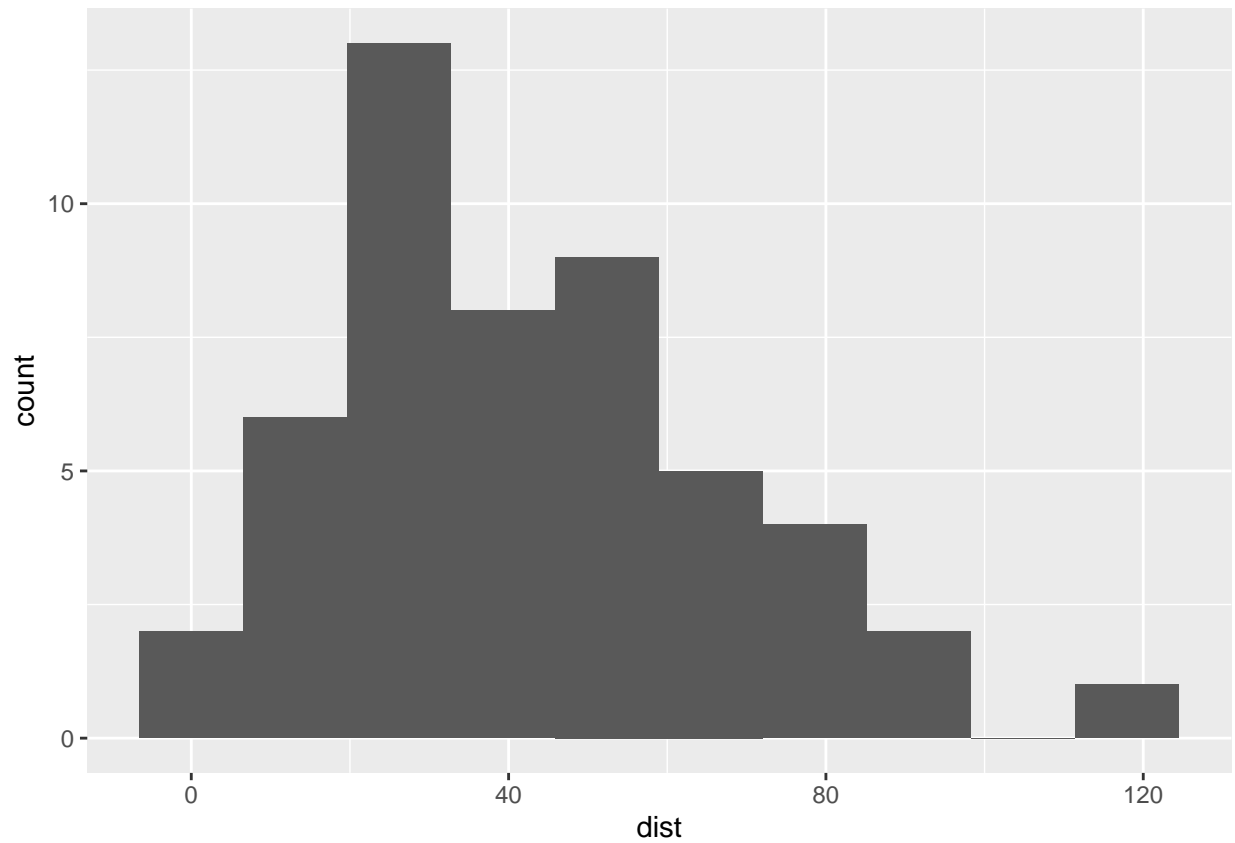



12.9

```
cars %>%  
  ggplot(aes(x=speed)) +  
  geom_histogram(bins=10)
```

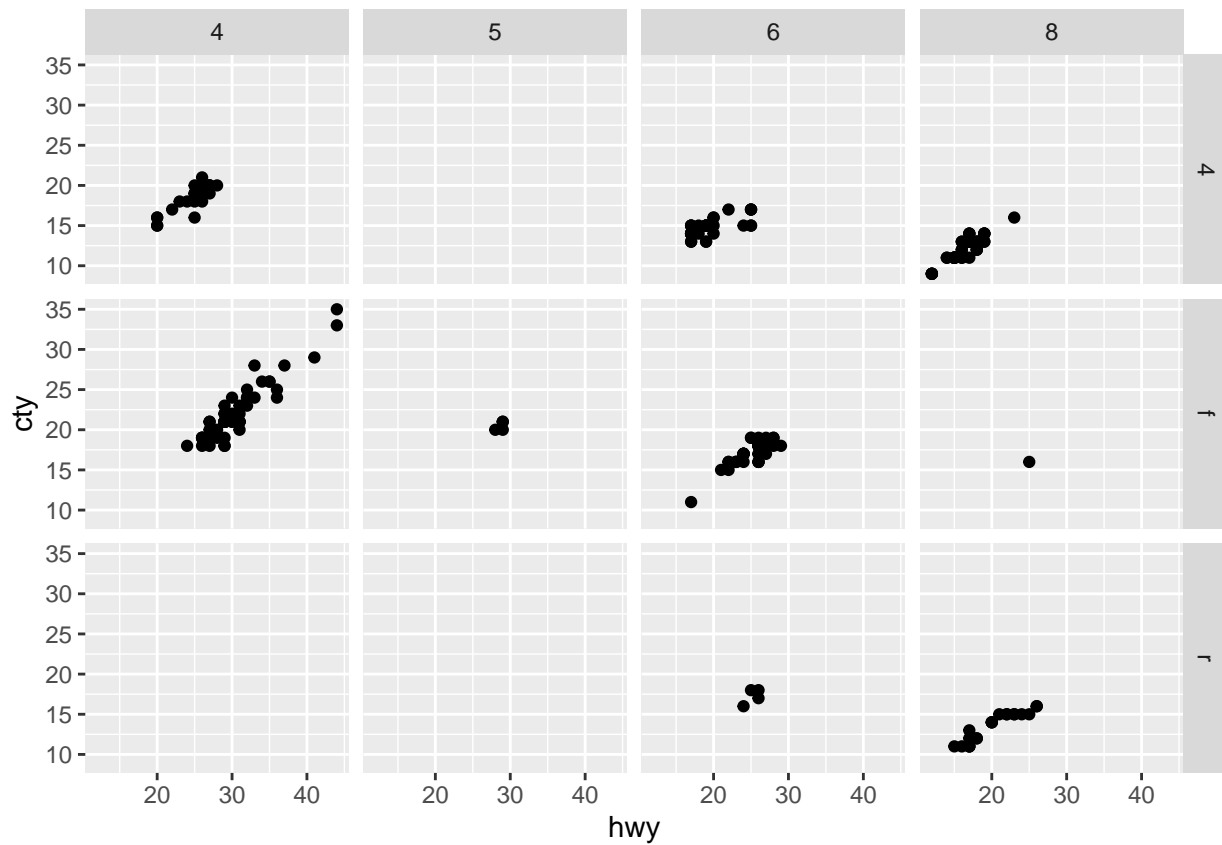


```
cars %>%  
  ggplot(aes(x=dist)) +  
  geom_histogram(bins=10)
```



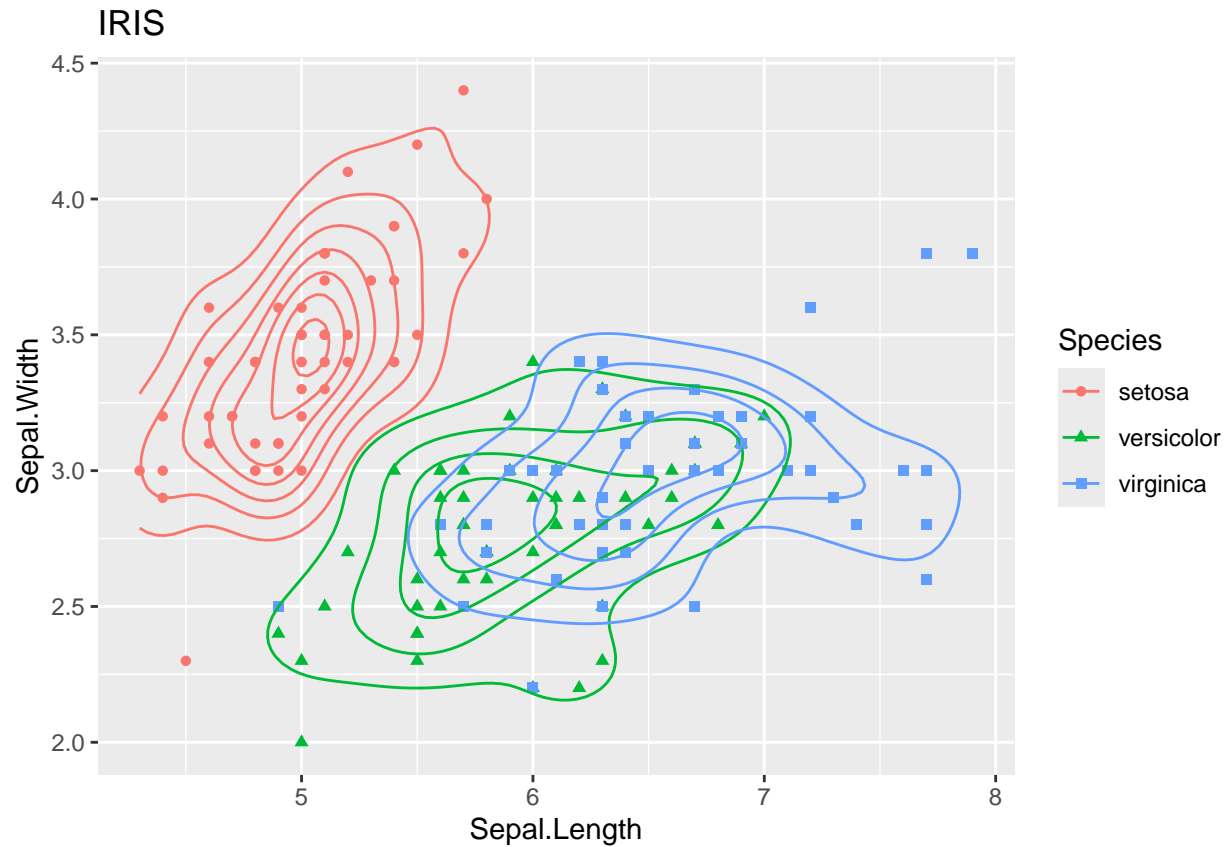
12.10

```
mpg %>%  
  ggplot() +  
  geom_point(aes(x=hwy,y=cty)) +  
  facet_grid(drv ~ cyl)
```



12.11

```
iris %>%
  ggplot(
    aes(x=Sepal.Length,y=Sepal.Width,
        color=Species, shape=Species)
  ) +
  geom_point() +
  geom_density2d() +
  ggtitle("IRIS")
```



```
theme_light()
```

```
## List of 136
## $ line                                     :List of 6
## ..$ colour                               : chr "black"
## ..$ linewidth                             : num 0.5
## ..$ linetype                              : num 1
## ..$ lineend                               : chr "butt"
## ..$ arrow                                 : logi FALSE
## ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_line" "element"
## $ rect                                     :List of 5
## ..$ fill                                   : chr "white"
## ..$ colour                               : chr "black"
## ..$ linewidth                             : num 0.5
## ..$ linetype                              : num 1
## ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_rect" "element"
## $ text                                     :List of 11
## ..$ family                               : chr ""
## ..$ face                                  : chr "plain"
## ..$ colour                               : chr "black"
## ..$ size                                  : num 11
## ..$ hjust                                : num 0.5
## ..$ vjust                                : num 0.5
## ..$ angle                                : num 0
```

```

## ..$ lineheight      : num 0.9
## ..$ margin          : 'margin' num [1:4] 0points 0points 0points 0points
## .. ..- attr(*, "unit")= int 8
## ..$ debug           : logi FALSE
## ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ title              : NULL
## $ aspect.ratio       : NULL
## $ axis.title          : NULL
## $ axis.title.x        :List of 11
## ..$ family          : NULL
## ..$ face             : NULL
## ..$ colour          : NULL
## ..$ size             : NULL
## ..$ hjust            : NULL
## ..$ vjust            : num 1
## ..$ angle            : NULL
## ..$ lineheight       : NULL
## ..$ margin          : 'margin' num [1:4] 2.75points 0points 0points 0points
## .. ..- attr(*, "unit")= int 8
## ..$ debug           : NULL
## ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.title.x.top    :List of 11
## ..$ family          : NULL
## ..$ face             : NULL
## ..$ colour          : NULL
## ..$ size             : NULL
## ..$ hjust            : NULL
## ..$ vjust            : num 0
## ..$ angle            : NULL
## ..$ lineheight       : NULL
## ..$ margin          : 'margin' num [1:4] 0points 0points 2.75points 0points
## .. ..- attr(*, "unit")= int 8
## ..$ debug           : NULL
## ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.title.x.bottom : NULL
## $ axis.title.y        :List of 11
## ..$ family          : NULL
## ..$ face             : NULL
## ..$ colour          : NULL
## ..$ size             : NULL
## ..$ hjust            : NULL
## ..$ vjust            : num 1
## ..$ angle            : num 90
## ..$ lineheight       : NULL
## ..$ margin          : 'margin' num [1:4] 0points 2.75points 0points 0points
## .. ..- attr(*, "unit")= int 8
## ..$ debug           : NULL
## ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.title.y.left   : NULL
## $ axis.title.y.right  :List of 11

```

```

## ..$ family      : NULL
## ..$ face        : NULL
## ..$ colour      : NULL
## ..$ size        : NULL
## ..$ hjust       : NULL
## ..$ vjust       : num 1
## ..$ angle       : num -90
## ..$ lineheight  : NULL
## ..$ margin      : 'margin' num [1:4] 0points 0points 0points 2.75points
## .. ..- attr(*, "unit")= int 8
## ..$ debug       : NULL
## ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.text          :List of 11
## ..$ family      : NULL
## ..$ face        : NULL
## ..$ colour      : chr "grey30"
## ..$ size        : 'rel' num 0.8
## ..$ hjust       : NULL
## ..$ vjust       : NULL
## ..$ angle       : NULL
## ..$ lineheight  : NULL
## ..$ margin      : NULL
## ..$ debug       : NULL
## ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.text.x        :List of 11
## ..$ family      : NULL
## ..$ face        : NULL
## ..$ colour      : NULL
## ..$ size        : NULL
## ..$ hjust       : NULL
## ..$ vjust       : num 1
## ..$ angle       : NULL
## ..$ lineheight  : NULL
## ..$ margin      : 'margin' num [1:4] 2.2points 0points 0points 0points
## .. ..- attr(*, "unit")= int 8
## ..$ debug       : NULL
## ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.text.x.top    :List of 11
## ..$ family      : NULL
## ..$ face        : NULL
## ..$ colour      : NULL
## ..$ size        : NULL
## ..$ hjust       : NULL
## ..$ vjust       : num 0
## ..$ angle       : NULL
## ..$ lineheight  : NULL
## ..$ margin      : 'margin' num [1:4] 0points 0points 2.2points 0points
## .. ..- attr(*, "unit")= int 8
## ..$ debug       : NULL
## ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_text" "element"

```

```

## $ axis.text.x.bottom          : NULL
## $ axis.text.y                 :List of 11
##   ..$ family                  : NULL
##   ..$ face                    : NULL
##   ..$ colour                  : NULL
##   ..$ size                    : NULL
##   ..$ hjust                   : num 1
##   ..$ vjust                   : NULL
##   ..$ angle                   : NULL
##   ..$ lineheight              : NULL
##   ..$ margin                  : 'margin' num [1:4] 0points 2.2points 0points 0points
##   ..- attr(*, "unit")= int 8
##   ..$ debug                   : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.text.y.left            : NULL
## $ axis.text.y.right           :List of 11
##   ..$ family                  : NULL
##   ..$ face                    : NULL
##   ..$ colour                  : NULL
##   ..$ size                    : NULL
##   ..$ hjust                   : num 0
##   ..$ vjust                   : NULL
##   ..$ angle                   : NULL
##   ..$ lineheight              : NULL
##   ..$ margin                  : 'margin' num [1:4] 0points 0points 0points 2.2points
##   ..- attr(*, "unit")= int 8
##   ..$ debug                   : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.text.theta             : NULL
## $ axis.text.r                 :List of 11
##   ..$ family                  : NULL
##   ..$ face                    : NULL
##   ..$ colour                  : NULL
##   ..$ size                    : NULL
##   ..$ hjust                   : num 0.5
##   ..$ vjust                   : NULL
##   ..$ angle                   : NULL
##   ..$ lineheight              : NULL
##   ..$ margin                  : 'margin' num [1:4] 0points 2.2points 0points 2.2points
##   ..- attr(*, "unit")= int 8
##   ..$ debug                   : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.ticks                  :List of 6
##   ..$ colour                  : chr "grey70"
##   ..$ linewidth               : 'rel' num 0.5
##   ..$ linetype                : NULL
##   ..$ lineend                 : NULL
##   ..$ arrow                   : logi FALSE
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_line" "element"
## $ axis.ticks.x                : NULL

```



```

## $ axis.ticks.x.top : NULL
## $ axis.ticks.x.bottom : NULL
## $ axis.ticks.y : NULL
## $ axis.ticks.y.left : NULL
## $ axis.ticks.y.right : NULL
## $ axis.ticks.theta : NULL
## $ axis.ticks.r : NULL
## $ axis.minor.ticks.x.top : NULL
## $ axis.minor.ticks.x.bottom : NULL
## $ axis.minor.ticks.y.left : NULL
## $ axis.minor.ticks.y.right : NULL
## $ axis.minor.ticks.theta : NULL
## $ axis.minor.ticks.r : NULL
## $ axis.ticks.length : 'simpleUnit' num 2.75points
## ..- attr(*, "unit")= int 8
## $ axis.ticks.length.x : NULL
## $ axis.ticks.length.x.top : NULL
## $ axis.ticks.length.x.bottom : NULL
## $ axis.ticks.length.y : NULL
## $ axis.ticks.length.y.left : NULL
## $ axis.ticks.length.y.right : NULL
## $ axis.ticks.length.theta : NULL
## $ axis.ticks.length.r : NULL
## $ axis.minor.ticks.length : 'rel' num 0.75
## $ axis.minor.ticks.length.x : NULL
## $ axis.minor.ticks.length.x.top : NULL
## $ axis.minor.ticks.length.x.bottom : NULL
## $ axis.minor.ticks.length.y : NULL
## $ axis.minor.ticks.length.y.left : NULL
## $ axis.minor.ticks.length.y.right : NULL
## $ axis.minor.ticks.length.theta : NULL
## $ axis.minor.ticks.length.r : NULL
## $ axis.line : list()
## ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ axis.line.x : NULL
## $ axis.line.x.top : NULL
## $ axis.line.x.bottom : NULL
## $ axis.line.y : NULL
## $ axis.line.y.left : NULL
## $ axis.line.y.right : NULL
## $ axis.line.theta : NULL
## $ axis.line.r : NULL
## $ legend.background :List of 5
## ..$ fill : NULL
## ..$ colour : logi NA
## ..$ linewidth : NULL
## ..$ linetype : NULL
## ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_rect" "element"
## $ legend.margin : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
## ..- attr(*, "unit")= int 8
## $ legend.spacing : 'simpleUnit' num 11points
## ..- attr(*, "unit")= int 8
## $ legend.spacing.x : NULL

```

```

## $ legend.spacing.y           : NULL
## $ legend.key                 : NULL
## $ legend.key.size            : 'simpleUnit' num 1.2lines
##   .- attr(*, "unit")= int 3
## $ legend.key.height          : NULL
## $ legend.key.width           : NULL
## $ legend.key.spacing         : 'simpleUnit' num 5.5points
##   .- attr(*, "unit")= int 8
## $ legend.key.spacing.x       : NULL
## $ legend.key.spacing.y       : NULL
## $ legend.frame               : NULL
## $ legend.ticks               : NULL
## $ legend.ticks.length        : 'rel' num 0.2
## $ legend.axis.line           : NULL
## $ legend.text                :List of 11
##   ..$ family                 : NULL
##   ..$ face                   : NULL
##   ..$ colour                 : NULL
##   ..$ size                   : 'rel' num 0.8
##   ..$ hjust                  : NULL
##   ..$ vjust                  : NULL
##   ..$ angle                  : NULL
##   ..$ lineheight             : NULL
##   ..$ margin                 : NULL
##   ..$ debug                  : NULL
##   ..$ inherit.blank: logi TRUE
##   .- attr(*, "class")= chr [1:2] "element_text" "element"
## $ legend.text.position       : NULL
## $ legend.title               :List of 11
##   ..$ family                 : NULL
##   ..$ face                   : NULL
##   ..$ colour                 : NULL
##   ..$ size                   : NULL
##   ..$ hjust                  : num 0
##   ..$ vjust                  : NULL
##   ..$ angle                  : NULL
##   ..$ lineheight             : NULL
##   ..$ margin                 : NULL
##   ..$ debug                  : NULL
##   ..$ inherit.blank: logi TRUE
##   .- attr(*, "class")= chr [1:2] "element_text" "element"
## $ legend.title.position      : NULL
## $ legend.position            : chr "right"
## $ legend.position.inside     : NULL
## $ legend.direction           : NULL
## $ legend.byrow               : NULL
## $ legend.justification       : chr "center"
## $ legend.justification.top   : NULL
## $ legend.justification.bottom : NULL
## $ legend.justification.left  : NULL
## $ legend.justification.right  : NULL
## $ legend.justification.inside : NULL
## $ legend.location            : NULL
## $ legend.box                 : NULL

```

```

## $ legend.box.just           : NULL
## $ legend.box.margin        : 'margin' num [1:4] 0cm 0cm 0cm 0cm
##  .- attr(*, "unit")= int 1
## $ legend.box.background     : list()
##  .- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ legend.box.spacing       : 'simpleUnit' num 11points
##  .- attr(*, "unit")= int 8
## [list output truncated]
## - attr(*, "class")= chr [1:2] "theme" "gg"
## - attr(*, "complete")= logi TRUE
## - attr(*, "validate")= logi TRUE

```