RWorksheet_Cartoja#6

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```
library(ggplot2)
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
```

```
data(mpg)
```

```
dataframe <- as.data.frame(mpg)
dataframe
```

```
##    manufacturer              model displ year cyl      trans drv cty hwy
## 1          audi                 a4   1.8 1999   4   auto(l5)   f  18  29
## 2          audi                 a4   1.8 1999   4 manual(m5)   f  21  29
## 3          audi                 a4   2.0 2008   4 manual(m6)   f  20  31
## 4          audi                 a4   2.0 2008   4   auto(av)   f  21  30
## 5          audi                 a4   2.8 1999   6   auto(l5)   f  16  26
## 6          audi                 a4   2.8 1999   6 manual(m5)   f  18  26
## 7          audi                 a4   3.1 2008   6   auto(av)   f  18  27
## 8          audi         a4 quattro   1.8 1999   4 manual(m5)   4  18  26
## 9          audi         a4 quattro   1.8 1999   4   auto(l5)   4  16  25
## 10         audi         a4 quattro   2.0 2008   4 manual(m6)   4  20  28
## 11         audi         a4 quattro   2.0 2008   4   auto(s6)   4  19  27
## 12         audi         a4 quattro   2.8 1999   6   auto(l5)   4  15  25
## 13         audi         a4 quattro   2.8 1999   6 manual(m5)   4  17  25
## 14         audi         a4 quattro   3.1 2008   6   auto(s6)   4  17  25
## 15         audi         a4 quattro   3.1 2008   6 manual(m6)   4  15  25
## 16         audi         a6 quattro   2.8 1999   6   auto(l5)   4  15  24
## 17         audi         a6 quattro   3.1 2008   6   auto(s6)   4  17  25
## 18         audi         a6 quattro   4.2 2008   8   auto(s6)   4  16  23
## 19    chevrolet c1500 suburban 2wd   5.3 2008   8   auto(l4)   r  14  20
## 20    chevrolet c1500 suburban 2wd   5.3 2008   8   auto(l4)   r  11  15
## 21    chevrolet c1500 suburban 2wd   5.3 2008   8   auto(l4)   r  14  20
## 22    chevrolet c1500 suburban 2wd   5.7 1999   8   auto(l4)   r  13  17
## 23    chevrolet c1500 suburban 2wd   6.0 2008   8   auto(l4)   r  12  17
## 24    chevrolet           corvette   5.7 1999   8 manual(m6)   r  16  26
## 25    chevrolet           corvette   5.7 1999   8   auto(l4)   r  15  23
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## 26    chevrolet           corvette  6.2 2008   8 manual(m6)   r  16  26
## 27    chevrolet           corvette  6.2 2008   8   auto(s6)   r  15  25
## 28    chevrolet           corvette  7.0 2008   8 manual(m6)   r  15  24
## 29    chevrolet      k1500 tahoe 4wd 5.3 2008  8   auto(l4)   4  14  19
## 30    chevrolet      k1500 tahoe 4wd 5.3 2008  8   auto(l4)   4  11  14
## 31    chevrolet      k1500 tahoe 4wd 5.7 1999  8   auto(l4)   4  11  15
## 32    chevrolet      k1500 tahoe 4wd 6.5 1999  8   auto(l4)   4  14  17
## 33    chevrolet             malibu  2.4 1999   4   auto(l4)   f  19  27
## 34    chevrolet             malibu  2.4 2008   4   auto(l4)   f  22  30
## 35    chevrolet             malibu  3.1 1999   6   auto(l4)   f  18  26
## 36    chevrolet             malibu  3.5 2008   6   auto(l4)   f  18  29
## 37    chevrolet             malibu  3.6 2008   6   auto(s6)   f  17  26
## 38        dodge         caravan 2wd 2.4 1999   4   auto(l3)   f  18  24
## 39        dodge         caravan 2wd 3.0 1999   6   auto(l4)   f  17  24
## 40        dodge         caravan 2wd 3.3 1999   6   auto(l4)   f  16  22
## 41        dodge         caravan 2wd 3.3 1999   6   auto(l4)   f  16  22
## 42        dodge         caravan 2wd 3.3 2008   6   auto(l4)   f  17  24
## 43        dodge         caravan 2wd 3.3 2008   6   auto(l4)   f  17  24
## 44        dodge         caravan 2wd 3.3 2008   6   auto(l4)   f  11  17
## 45        dodge         caravan 2wd 3.8 1999   6   auto(l4)   f  15  22
## 46        dodge         caravan 2wd 3.8 1999   6   auto(l4)   f  15  21
## 47        dodge         caravan 2wd 3.8 2008   6   auto(l6)   f  16  23
## 48        dodge         caravan 2wd 4.0 2008   6   auto(l6)   f  16  23
## 49        dodge   dakota pickup 4wd 3.7 2008   6 manual(m6)   4  15  19
## 50        dodge   dakota pickup 4wd 3.7 2008   6   auto(l4)   4  14  18
## 51        dodge   dakota pickup 4wd 3.9 1999   6   auto(l4)   4  13  17
## 52        dodge   dakota pickup 4wd 3.9 1999   6 manual(m5)   4  14  17
## 53        dodge   dakota pickup 4wd 4.7 2008   8   auto(l5)   4  14  19
## 54        dodge   dakota pickup 4wd 4.7 2008   8   auto(l5)   4  14  19
## 55        dodge   dakota pickup 4wd 4.7 2008   8   auto(l5)   4   9  12
## 56        dodge   dakota pickup 4wd 5.2 1999   8 manual(m5)   4  11  17
## 57        dodge   dakota pickup 4wd 5.2 1999   8   auto(l4)   4  11  15
## 58        dodge         durango 4wd 3.9 1999   6   auto(l4)   4  13  17
## 59        dodge         durango 4wd 4.7 2008   8   auto(l5)   4  13  17
## 60        dodge         durango 4wd 4.7 2008   8   auto(l5)   4   9  12
## 61        dodge         durango 4wd 4.7 2008   8   auto(l5)   4  13  17
## 62        dodge         durango 4wd 5.2 1999   8   auto(l4)   4  11  16
## 63        dodge         durango 4wd 5.7 2008   8   auto(l5)   4  13  18
## 64        dodge         durango 4wd 5.9 1999   8   auto(l4)   4  11  15
## 65        dodge  ram 1500 pickup 4wd 4.7 2008  8 manual(m6)   4  12  16
## 66        dodge  ram 1500 pickup 4wd 4.7 2008  8   auto(l5)   4   9  12
## 67        dodge  ram 1500 pickup 4wd 4.7 2008  8   auto(l5)   4  13  17
## 68        dodge  ram 1500 pickup 4wd 4.7 2008  8   auto(l5)   4  13  17
## 69        dodge  ram 1500 pickup 4wd 4.7 2008  8 manual(m6)   4  12  16
## 70        dodge  ram 1500 pickup 4wd 4.7 2008  8 manual(m6)   4   9  12
## 71        dodge  ram 1500 pickup 4wd 5.2 1999  8   auto(l4)   4  11  15
## 72        dodge  ram 1500 pickup 4wd 5.2 1999  8 manual(m5)   4  11  16
## 73        dodge  ram 1500 pickup 4wd 5.7 2008  8   auto(l5)   4  13  17
## 74        dodge  ram 1500 pickup 4wd 5.9 1999  8   auto(l4)   4  11  15
## 75         ford       expedition 2wd 4.6 1999  8   auto(l4)   r  11  17
## 76         ford       expedition 2wd 5.4 1999  8   auto(l4)   r  11  17
## 77         ford       expedition 2wd 5.4 2008  8   auto(l6)   r  12  18
## 78         ford        explorer 4wd 4.0 1999   6   auto(l5)   4  14  17
## 79         ford        explorer 4wd 4.0 1999   6 manual(m5)   4  15  19
```

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```
## 80       ford        explorer 4wd  4.0 1999  6   auto(l5)  4  14  17
## 81       ford        explorer 4wd  4.0 2008  6   auto(l5)  4  13  19
## 82       ford        explorer 4wd  4.6 2008  8   auto(l6)  4  13  19
## 83       ford        explorer 4wd  5.0 1999  8   auto(l4)  4  13  17
## 84       ford      f150 pickup 4wd 4.2 1999  6   auto(l4)  4  14  17
## 85       ford      f150 pickup 4wd 4.2 1999  6 manual(m5)  4  14  17
## 86       ford      f150 pickup 4wd 4.6 1999  8 manual(m5)  4  13  16
## 87       ford      f150 pickup 4wd 4.6 1999  8   auto(l4)  4  13  16
## 88       ford      f150 pickup 4wd 4.6 2008  8   auto(l4)  4  13  17
## 89       ford      f150 pickup 4wd 5.4 1999  8   auto(l4)  4  11  15
## 90       ford      f150 pickup 4wd 5.4 2008  8   auto(l4)  4  13  17
## 91       ford           mustang  3.8 1999  6 manual(m5)  r  18  26
## 92       ford           mustang  3.8 1999  6   auto(l4)  r  18  25
## 93       ford           mustang  4.0 2008  6 manual(m5)  r  17  26
## 94       ford           mustang  4.0 2008  6   auto(l5)  r  16  24
## 95       ford           mustang  4.6 1999  8   auto(l4)  r  15  21
## 96       ford           mustang  4.6 1999  8 manual(m5)  r  15  22
## 97       ford           mustang  4.6 2008  8 manual(m5)  r  15  23
## 98       ford           mustang  4.6 2008  8   auto(l5)  r  15  22
## 99       ford           mustang  5.4 2008  8 manual(m6)  r  14  20
## 100      honda             civic 1.6 1999  4 manual(m5)  f  28  33
## 101      honda             civic 1.6 1999  4   auto(l4)  f  24  32
## 102      honda             civic 1.6 1999  4 manual(m5)  f  25  32
## 103      honda             civic 1.6 1999  4 manual(m5)  f  23  29
## 104      honda             civic 1.6 1999  4   auto(l4)  f  24  32
## 105      honda             civic 1.8 2008  4 manual(m5)  f  26  34
## 106      honda             civic 1.8 2008  4   auto(l5)  f  25  36
## 107      honda             civic 1.8 2008  4   auto(l5)  f  24  36
## 108      honda             civic 2.0 2008  4 manual(m6)  f  21  29
## 109    hyundai            sonata 2.4 1999  4   auto(l4)  f  18  26
## 110    hyundai            sonata 2.4 1999  4 manual(m5)  f  18  27
## 111    hyundai            sonata 2.4 2008  4   auto(l4)  f  21  30
## 112    hyundai            sonata 2.4 2008  4 manual(m5)  f  21  31
## 113    hyundai            sonata 2.5 1999  6   auto(l4)  f  18  26
## 114    hyundai            sonata 2.5 1999  6 manual(m5)  f  18  26
## 115    hyundai            sonata 3.3 2008  6   auto(l5)  f  19  28
## 116    hyundai           tiburon 2.0 1999  4   auto(l4)  f  19  26
## 117    hyundai           tiburon 2.0 1999  4 manual(m5)  f  19  29
## 118    hyundai           tiburon 2.0 2008  4 manual(m5)  f  20  28
## 119    hyundai           tiburon 2.0 2008  4   auto(l4)  f  20  27
## 120    hyundai           tiburon 2.7 2008  6   auto(l4)  f  17  24
## 121    hyundai           tiburon 2.7 2008  6 manual(m6)  f  16  24
## 122    hyundai           tiburon 2.7 2008  6 manual(m5)  f  17  24
## 123       jeep  grand cherokee 4wd 3.0 2008  6   auto(l5)  4  17  22
## 124       jeep  grand cherokee 4wd 3.7 2008  6   auto(l5)  4  15  19
## 125       jeep  grand cherokee 4wd 4.0 1999  6   auto(l4)  4  15  20
## 126       jeep  grand cherokee 4wd 4.7 1999  8   auto(l4)  4  14  17
## 127       jeep  grand cherokee 4wd 4.7 2008  8   auto(l5)  4   9  12
## 128       jeep  grand cherokee 4wd 4.7 2008  8   auto(l5)  4  14  19
## 129       jeep  grand cherokee 4wd 5.7 2008  8   auto(l5)  4  13  18
## 130       jeep  grand cherokee 4wd 6.1 2008  8   auto(l5)  4  11  14
## 131  land rover        range rover 4.0 1999  8   auto(l4)  4  11  15
## 132  land rover        range rover 4.2 2008  8   auto(s6)  4  12  18
## 133  land rover        range rover 4.4 2008  8   auto(s6)  4  12  18
```

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## 134   land rover       range rover  4.6 1999  8   auto(14)  4  11  15
## 135     lincoln      navigator 2wd  5.4 1999  8   auto(14)  r  11  17
## 136     lincoln      navigator 2wd  5.4 1999  8   auto(14)  r  11  16
## 137     lincoln      navigator 2wd  5.4 2008  8   auto(16)  r  12  18
## 138     mercury    mountaineer 4wd  4.0 1999  6   auto(15)  4  14  17
## 139     mercury    mountaineer 4wd  4.0 2008  6   auto(15)  4  13  19
## 140     mercury    mountaineer 4wd  4.6 2008  8   auto(16)  4  13  19
## 141     mercury    mountaineer 4wd  5.0 1999  8   auto(14)  4  13  17
## 142      nissan            altima  2.4 1999  4 manual(m5)  f  21  29
## 143      nissan            altima  2.4 1999  4   auto(14)  f  19  27
## 144      nissan            altima  2.5 2008  4   auto(av)  f  23  31
## 145      nissan            altima  2.5 2008  4 manual(m6)  f  23  32
## 146      nissan            altima  3.5 2008  6 manual(m6)  f  19  27
## 147      nissan            altima  3.5 2008  6   auto(av)  f  19  26
## 148      nissan            maxima  3.0 1999  6   auto(14)  f  18  26
## 149      nissan            maxima  3.0 1999  6 manual(m5)  f  19  25
## 150      nissan            maxima  3.5 2008  6   auto(av)  f  19  25
## 151      nissan     pathfinder 4wd  3.3 1999  6   auto(14)  4  14  17
## 152      nissan     pathfinder 4wd  3.3 1999  6 manual(m5)  4  15  17
## 153      nissan     pathfinder 4wd  4.0 2008  6   auto(15)  4  14  20
## 154      nissan     pathfinder 4wd  5.6 2008  8   auto(s5)  4  12  18
## 155     pontiac         grand prix  3.1 1999  6   auto(14)  f  18  26
## 156     pontiac         grand prix  3.8 1999  6   auto(14)  f  16  26
## 157     pontiac         grand prix  3.8 1999  6   auto(14)  f  17  27
## 158     pontiac         grand prix  3.8 2008  6   auto(14)  f  18  28
## 159     pontiac         grand prix  5.3 2008  8   auto(s4)  f  16  25
## 160      subaru       forester awd  2.5 1999  4 manual(m5)  4  18  25
## 161      subaru       forester awd  2.5 1999  4   auto(14)  4  18  24
## 162      subaru       forester awd  2.5 2008  4 manual(m5)  4  20  27
## 163      subaru       forester awd  2.5 2008  4 manual(m5)  4  19  25
## 164      subaru       forester awd  2.5 2008  4   auto(14)  4  20  26
## 165      subaru       forester awd  2.5 2008  4   auto(14)  4  18  23
## 166      subaru        impreza awd  2.2 1999  4   auto(14)  4  21  26
## 167      subaru        impreza awd  2.2 1999  4 manual(m5)  4  19  26
## 168      subaru        impreza awd  2.5 1999  4 manual(m5)  4  19  26
## 169      subaru        impreza awd  2.5 1999  4   auto(14)  4  19  26
## 170      subaru        impreza awd  2.5 2008  4   auto(s4)  4  20  25
## 171      subaru        impreza awd  2.5 2008  4   auto(s4)  4  20  27
## 172      subaru        impreza awd  2.5 2008  4 manual(m5)  4  19  25
## 173      subaru        impreza awd  2.5 2008  4 manual(m5)  4  20  27
## 174      toyota        4runner 4wd  2.7 1999  4 manual(m5)  4  15  20
## 175      toyota        4runner 4wd  2.7 1999  4   auto(14)  4  16  20
## 176      toyota        4runner 4wd  3.4 1999  6   auto(14)  4  15  19
## 177      toyota        4runner 4wd  3.4 1999  6 manual(m5)  4  15  17
## 178      toyota        4runner 4wd  4.0 2008  6   auto(15)  4  16  20
## 179      toyota        4runner 4wd  4.7 2008  8   auto(15)  4  14  17
## 180      toyota             camry  2.2 1999  4 manual(m5)  f  21  29
## 181      toyota             camry  2.2 1999  4   auto(14)  f  21  27
## 182      toyota             camry  2.4 2008  4 manual(m5)  f  21  31
## 183      toyota             camry  2.4 2008  4   auto(15)  f  21  31
## 184      toyota             camry  3.0 1999  6   auto(14)  f  18  26
## 185      toyota             camry  3.0 1999  6 manual(m5)  f  18  26
## 186      toyota             camry  3.5 2008  6   auto(s6)  f  19  28
## 187      toyota       camry solara  2.2 1999  4   auto(14)  f  21  27
```

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## 188         toyota          camry solara 2.2 1999    4 manual(m5) f  21  29
## 189         toyota          camry solara 2.4 2008    4 manual(m5) f  21  31
## 190         toyota          camry solara 2.4 2008    4   auto(s5) f  22  31
## 191         toyota          camry solara 3.0 1999    6   auto(l4) f  18  26
## 192         toyota          camry solara 3.0 1999    6 manual(m5) f  18  26
## 193         toyota          camry solara 3.3 2008    6   auto(s5) f  18  27
## 194         toyota               corolla 1.8 1999    4   auto(l3) f  24  30
## 195         toyota               corolla 1.8 1999    4   auto(l4) f  24  33
## 196         toyota               corolla 1.8 1999    4 manual(m5) f  26  35
## 197         toyota               corolla 1.8 2008    4 manual(m5) f  28  37
## 198         toyota               corolla 1.8 2008    4   auto(l4) f  26  35
## 199         toyota land cruiser wagon 4wd 4.7 1999    8   auto(l4) 4  11  15
## 200         toyota land cruiser wagon 4wd 5.7 2008    8   auto(s6) 4  13  18
## 201         toyota      toyota tacoma 4wd 2.7 1999    4 manual(m5) 4  15  20
## 202         toyota      toyota tacoma 4wd 2.7 1999    4   auto(l4) 4  16  20
## 203         toyota      toyota tacoma 4wd 2.7 2008    4 manual(m5) 4  17  22
## 204         toyota      toyota tacoma 4wd 3.4 1999    6 manual(m5) 4  15  17
## 205         toyota      toyota tacoma 4wd 3.4 1999    6   auto(l4) 4  15  19
## 206         toyota      toyota tacoma 4wd 4.0 2008    6 manual(m6) 4  15  18
## 207         toyota      toyota tacoma 4wd 4.0 2008    6   auto(l5) 4  16  20
## 208     volkswagen                   gti 2.0 1999    4 manual(m5) f  21  29
## 209     volkswagen                   gti 2.0 1999    4   auto(l4) f  19  26
## 210     volkswagen                   gti 2.0 2008    4 manual(m6) f  21  29
## 211     volkswagen                   gti 2.0 2008    4   auto(s6) f  22  29
## 212     volkswagen                   gti 2.8 1999    6 manual(m5) f  17  24
## 213     volkswagen                 jetta 1.9 1999    4 manual(m5) f  33  44
## 214     volkswagen                 jetta 2.0 1999    4 manual(m5) f  21  29
## 215     volkswagen                 jetta 2.0 1999    4   auto(l4) f  19  26
## 216     volkswagen                 jetta 2.0 2008    4   auto(s6) f  22  29
## 217     volkswagen                 jetta 2.0 2008    4 manual(m6) f  21  29
## 218     volkswagen                 jetta 2.5 2008    5   auto(s6) f  21  29
## 219     volkswagen                 jetta 2.5 2008    5 manual(m5) f  21  29
## 220     volkswagen                 jetta 2.8 1999    6   auto(l4) f  16  23
## 221     volkswagen                 jetta 2.8 1999    6 manual(m5) f  17  24
## 222     volkswagen            new beetle 1.9 1999    4 manual(m5) f  35  44
## 223     volkswagen            new beetle 1.9 1999    4   auto(l4) f  29  41
## 224     volkswagen            new beetle 2.0 1999    4 manual(m5) f  21  29
## 225     volkswagen            new beetle 2.0 1999    4   auto(l4) f  19  26
## 226     volkswagen            new beetle 2.5 2008    5 manual(m5) f  20  28
## 227     volkswagen            new beetle 2.5 2008    5   auto(s6) f  20  29
## 228     volkswagen                passat 1.8 1999    4 manual(m5) f  21  29
## 229     volkswagen                passat 1.8 1999    4   auto(l5) f  18  29
## 230     volkswagen                passat 2.0 2008    4   auto(s6) f  19  28
## 231     volkswagen                passat 2.0 2008    4 manual(m6) f  21  29
## 232     volkswagen                passat 2.8 1999    6   auto(l5) f  16  26
## 233     volkswagen                passat 2.8 1999    6 manual(m5) f  18  26
## 234     volkswagen                passat 3.6 2008    6   auto(s6) f  17  26
##      fl    class
## 1     p  compact
## 2     p  compact
## 3     p  compact
## 4     p  compact
## 5     p  compact
## 6     p  compact
```

```
## 7    p   compact
## 8    p   compact
## 9    p   compact
## 10   p   compact
## 11   p   compact
## 12   p   compact
## 13   p   compact
## 14   p   compact
## 15   p   compact
## 16   p   midsize
## 17   p   midsize
## 18   p   midsize
## 19   r      suv
## 20   e      suv
## 21   r      suv
## 22   r      suv
## 23   r      suv
## 24   p   2seater
## 25   p   2seater
## 26   p   2seater
## 27   p   2seater
## 28   p   2seater
## 29   r      suv
## 30   e      suv
## 31   r      suv
## 32   d      suv
## 33   r   midsize
## 34   r   midsize
## 35   r   midsize
## 36   r   midsize
## 37   r   midsize
## 38   r   minivan
## 39   r   minivan
## 40   r   minivan
## 41   r   minivan
## 42   r   minivan
## 43   r   minivan
## 44   e   minivan
## 45   r   minivan
## 46   r   minivan
## 47   r   minivan
## 48   r   minivan
## 49   r    pickup
## 50   r    pickup
## 51   r    pickup
## 52   r    pickup
## 53   r    pickup
## 54   r    pickup
## 55   e    pickup
## 56   r    pickup
## 57   r    pickup
## 58   r      suv
## 59   r      suv
## 60   e      suv
```

```
## 61   r        suv
## 62   r        suv
## 63   r        suv
## 64   r        suv
## 65   r      pickup
## 66   e      pickup
## 67   r      pickup
## 68   r      pickup
## 69   r      pickup
## 70   e      pickup
## 71   r      pickup
## 72   r      pickup
## 73   r      pickup
## 74   r      pickup
## 75   r        suv
## 76   r        suv
## 77   r        suv
## 78   r        suv
## 79   r        suv
## 80   r        suv
## 81   r        suv
## 82   r        suv
## 83   r        suv
## 84   r      pickup
## 85   r      pickup
## 86   r      pickup
## 87   r      pickup
## 88   r      pickup
## 89   r      pickup
## 90   r      pickup
## 91   r subcompact
## 92   r subcompact
## 93   r subcompact
## 94   r subcompact
## 95   r subcompact
## 96   r subcompact
## 97   r subcompact
## 98   r subcompact
## 99   p subcompact
## 100  r subcompact
## 101  r subcompact
## 102  r subcompact
## 103  p subcompact
## 104  r subcompact
## 105  r subcompact
## 106  r subcompact
## 107  c subcompact
## 108  p subcompact
## 109  r     midsize
## 110  r     midsize
## 111  r     midsize
## 112  r     midsize
## 113  r     midsize
## 114  r     midsize
```

```
## 115  r      midsize
## 116  r subcompact
## 117  r subcompact
## 118  r subcompact
## 119  r subcompact
## 120  r subcompact
## 121  r subcompact
## 122  r subcompact
## 123  d         suv
## 124  r         suv
## 125  r         suv
## 126  r         suv
## 127  e         suv
## 128  r         suv
## 129  r         suv
## 130  p         suv
## 131  p         suv
## 132  r         suv
## 133  r         suv
## 134  p         suv
## 135  r         suv
## 136  p         suv
## 137  r         suv
## 138  r         suv
## 139  r         suv
## 140  r         suv
## 141  r         suv
## 142  r     compact
## 143  r     compact
## 144  r     midsize
## 145  r     midsize
## 146  p     midsize
## 147  p     midsize
## 148  r     midsize
## 149  r     midsize
## 150  p     midsize
## 151  r         suv
## 152  r         suv
## 153  p         suv
## 154  p         suv
## 155  r     midsize
## 156  p     midsize
## 157  r     midsize
## 158  r     midsize
## 159  p     midsize
## 160  r         suv
## 161  r         suv
## 162  r         suv
## 163  p         suv
## 164  r         suv
## 165  p         suv
## 166  r subcompact
## 167  r subcompact
## 168  r subcompact
```

```
## 169  r subcompact
## 170  p    compact
## 171  r    compact
## 172  p    compact
## 173  r    compact
## 174  r        suv
## 175  r        suv
## 176  r        suv
## 177  r        suv
## 178  r        suv
## 179  r        suv
## 180  r    midsize
## 181  r    midsize
## 182  r    midsize
## 183  r    midsize
## 184  r    midsize
## 185  r    midsize
## 186  r    midsize
## 187  r    compact
## 188  r    compact
## 189  r    compact
## 190  r    compact
## 191  r    compact
## 192  r    compact
## 193  r    compact
## 194  r    compact
## 195  r    compact
## 196  r    compact
## 197  r    compact
## 198  r    compact
## 199  r        suv
## 200  r        suv
## 201  r     pickup
## 202  r     pickup
## 203  r     pickup
## 204  r     pickup
## 205  r     pickup
## 206  r     pickup
## 207  r     pickup
## 208  r    compact
## 209  r    compact
## 210  p    compact
## 211  p    compact
## 212  r    compact
## 213  d    compact
## 214  r    compact
## 215  r    compact
## 216  p    compact
## 217  p    compact
## 218  r    compact
## 219  r    compact
## 220  r    compact
## 221  r    compact
## 222  d subcompact
```

```
## 223    d subcompact
## 224    r subcompact
## 225    r subcompact
## 226    r subcompact
## 227    r subcompact
## 228    p    midsize
## 229    p    midsize
## 230    p    midsize
## 231    p    midsize
## 232    p    midsize
## 233    p    midsize
## 234    p    midsize
```

#1. How many columns are in mpg dataset? How about the number of rows? Show the codes and its result.

```
mpg_dataset <- glimpse(dataframe)
```

```
## Rows: 234
## Columns: 11
## $ manufacturer <chr> "audi", "audi", "audi", "audi", "audi", "audi", "audi", "~
## $ model        <chr> "a4", "a4", "a4", "a4", "a4", "a4", "a4", "a4 quattro", "~
## $ displ        <dbl> 1.8, 1.8, 2.0, 2.0, 2.8, 2.8, 3.1, 1.8, 1.8, 2.0, 2.0, 2.~
## $ year         <int> 1999, 1999, 2008, 2008, 1999, 1999, 2008, 1999, 1999, 200~
## $ cyl          <int> 4, 4, 4, 4, 6, 6, 6, 4, 4, 4, 4, 6, 6, 6, 6, 6, 6, 8, 8, ~
## $ trans        <chr> "auto(l5)", "manual(m5)", "manual(m6)", "auto(av)", "auto~
## $ drv          <chr> "f", "f", "f", "f", "f", "f", "f", "4", "4", "4", "4", "4~
## $ cty          <int> 18, 21, 20, 21, 16, 18, 18, 18, 16, 20, 19, 15, 17, 17, 1~
## $ hwy          <int> 29, 29, 31, 30, 26, 26, 27, 26, 25, 28, 27, 25, 25, 25, 2~
## $ fl           <chr> "p", "p", "p", "p", "p", "p", "p", "p", "p", "p", "p", "p~
## $ class        <chr> "compact", "compact", "compact", "compact", "compact", "c~
#Answer: It has 11 columns and a row of 234
```

#2. Which manufacturer has the most models in this data set? Which model has the most variations?

```
manufacturer <- mpg_dataset %>% group_by(manufacturer,model) %>% count()
manufacturer
```

```
## # A tibble: 38 x 3
## # Groups:   manufacturer, model [38]
##    manufacturer model                 n
##    <chr>        <chr>             <int>
##  1 audi         a4                    7
##  2 audi         a4 quattro            8
##  3 audi         a6 quattro            3
##  4 chevrolet    c1500 suburban 2wd    5
##  5 chevrolet    corvette              5
##  6 chevrolet    k1500 tahoe 4wd       4
##  7 chevrolet    malibu                5
##  8 dodge        caravan 2wd          11
##  9 dodge        dakota pickup 4wd     9
## 10 dodge        durango 4wd           7
## # ... with 28 more rows
```

#a. Group the manufacturers and find the unique models. Copy the codes and result.

```
unique_model <- mpg_dataset %>% group_by(manufacturer) %>%
          distinct(model) %>% count()
```

```
unique_model
```

```
## # A tibble: 15 x 2
## # Groups:   manufacturer [15]
##    manufacturer     n
##    <chr>         <int>
##  1 audi              3
##  2 chevrolet         4
##  3 dodge             4
##  4 ford              4
##  5 honda             1
##  6 hyundai           2
##  7 jeep              1
##  8 land rover        1
##  9 lincoln           1
## 10 mercury           1
## 11 nissan            3
## 12 pontiac           1
## 13 subaru            2
## 14 toyota            6
## 15 volkswagen        4
```
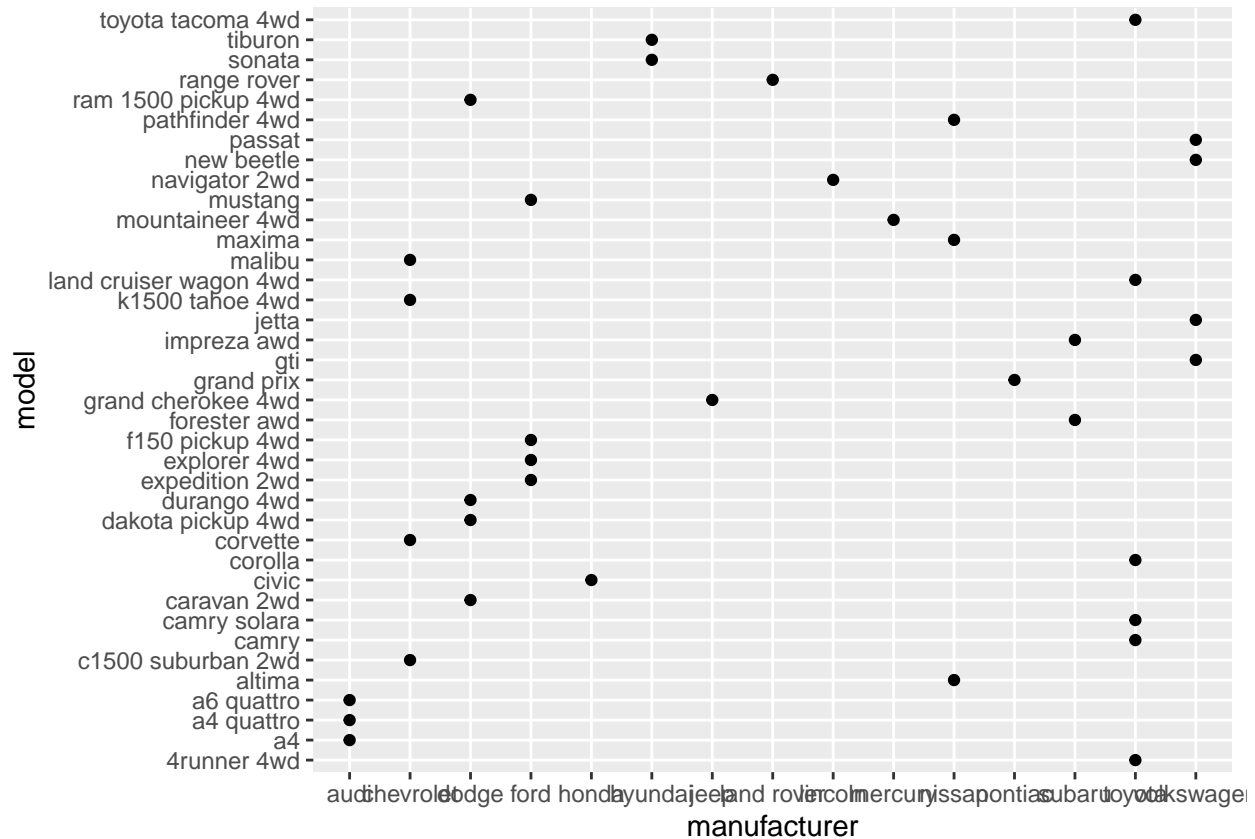
```
colnames(unique_model)<-c("manufacturer", "Unique Counts")
```

#b. Graph the result by using plot() and ggplot(). Write the codes and its result.

```
plot(manufacturer)
```
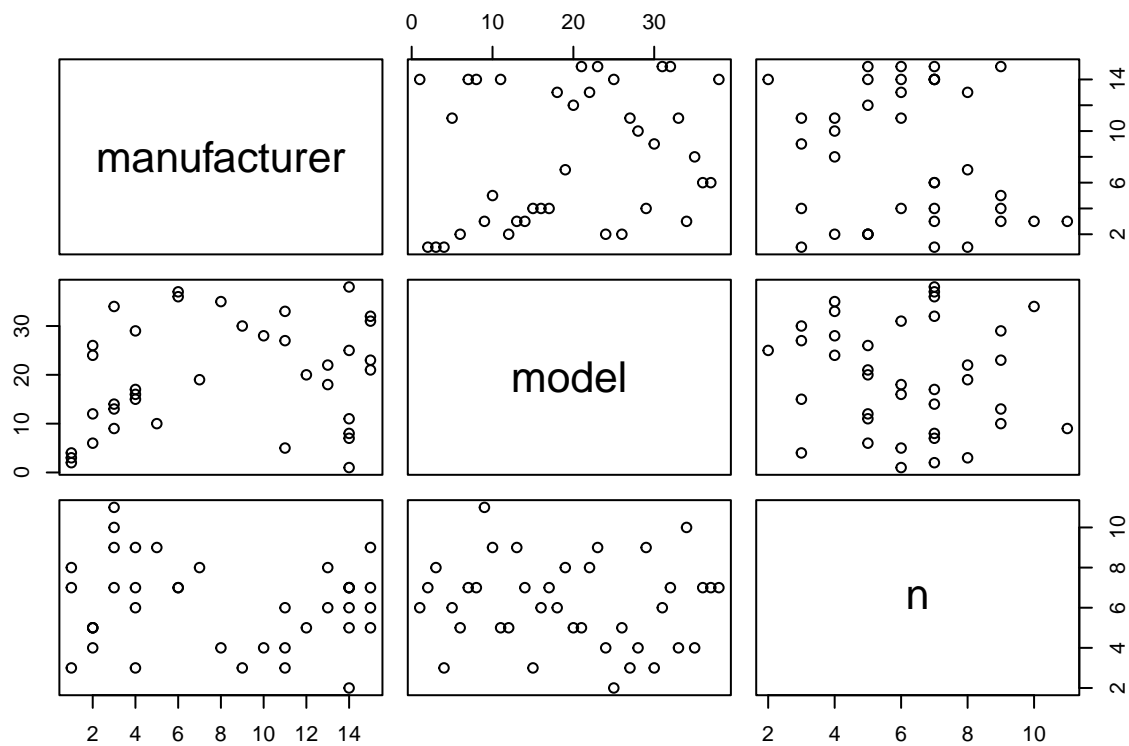
```
ggplot(manufacturer, aes(manufacturer, model)) + geom_point()
```


#3. Same dataset will be used. You are going to show the relationship of the model and the manufacturer.

#a. What does ggplot(mpg, aes(model, manufacturer)) + geom_point() show?

```
 # Answer: It shows the point graph of a model and manufacturer of mpg data set.

ggplot(dataframe, aes(model, manufacturer)) + geom_point()
```
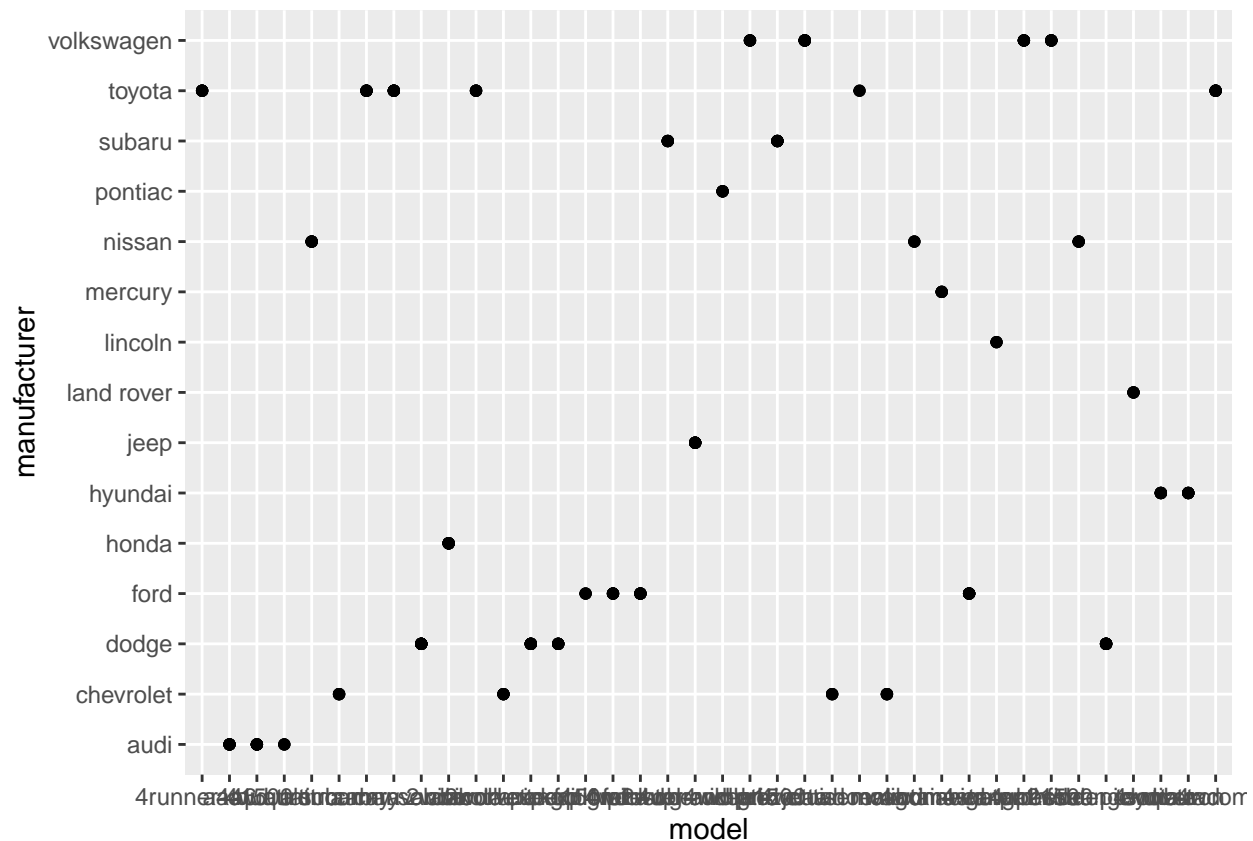
#b. For you, is it useful? If not, how could you modify the data to make it more informative?

#Answer: For me, basically, it is useful. But it can be more modify if there is a legend to help readin

#4. Using the pipe (%>%), group the model and get the number of cars per model. Show codes and its result.

```
cars_per_model <- mpg_dataset %>% group_by(model) %>% count()
cars_per_model
```

```
## # A tibble: 38 x 2
## # Groups:   model [38]
##    model                  n
##    <chr>              <int>
##  1 4runner 4wd            6
##  2 a4                     7
##  3 a4 quattro             8
##  4 a6 quattro             3
##  5 altima                 6
##  6 c1500 suburban 2wd     5
##  7 camry                  7
##  8 camry solara           7
##  9 caravan 2wd           11
## 10 civic                  9
## # ... with 28 more rows
```

```
colnames(cars_per_model) <- c("Model","Counts")
cars_per_model
```

```
## # A tibble: 38 x 2
## # Groups:   Model [38]
##    Model             Counts
##    <chr>              <int>
##  1 4runner 4wd            6
##  2 a4                     7
##  3 a4 quattro             8
##  4 a6 quattro             3
##  5 altima                 6
##  6 c1500 suburban 2wd     5
##  7 camry                  7
##  8 camry solara           7
##  9 caravan 2wd           11
## 10 civic                  9
## # ... with 28 more rows
```

#a. Plot using the geom_bar() + coord_flip() just like what is shown below. Show codes and its result.

```
qplot(model, data = dataframe,
      main = "Number of Cars per Model",
      xlab = "Model",
      ylab = "Number of Cars", geom = "bar", fill = manufacturer) + coord_flip()
```

```
## Warning: `qplot()` was deprecated in ggplot2 3.4.0.
```


Number of Cars per Model
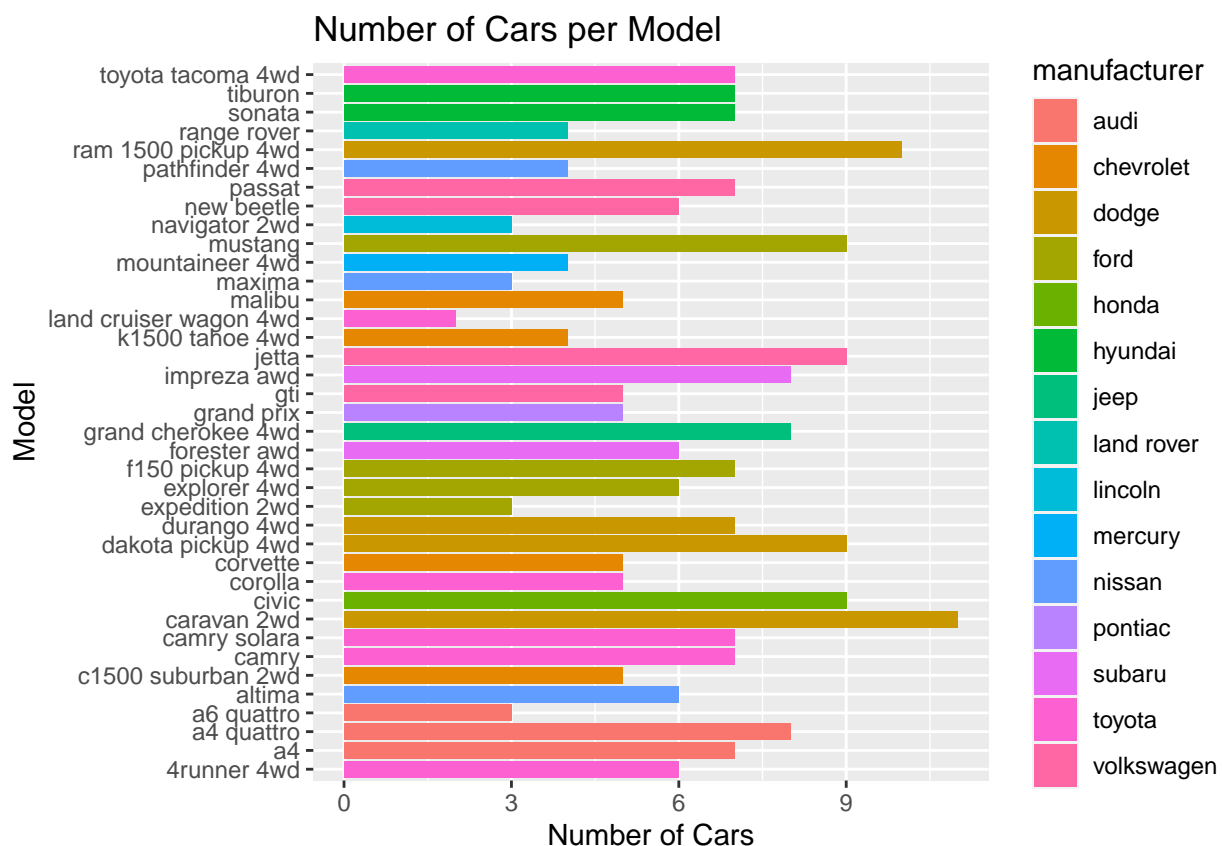
#b. Use only the top 20 observations. Show code and results.

```
twenty <- cars_per_model[1:20,] %>% top_n(2)
```

```
## Selecting by Counts
twenty
```

```
## # A tibble: 20 x 2
## # Groups:   Model [20]
##    Model                Counts
##    <chr>                 <int>
##  1 4runner 4wd               6
##  2 a4                        7
##  3 a4 quattro                8
##  4 a6 quattro                3
##  5 altima                    6
##  6 c1500 suburban 2wd        5
##  7 camry                     7
##  8 camry solara              7
##  9 caravan 2wd              11
## 10 civic                     9
## 11 corolla                   5
## 12 corvette                  5
## 13 dakota pickup 4wd         9
## 14 durango 4wd               7
## 15 expedition 2wd            3
## 16 explorer 4wd              6
## 17 f150 pickup 4wd           7
## 18 forester awd              6
## 19 grand cherokee 4wd        8
## 20 grand prix                5
```

```
ggplot(twenty, aes(x = Model, y = Counts)) + geom_bar(stat = "Identity") + coord_flip()
```
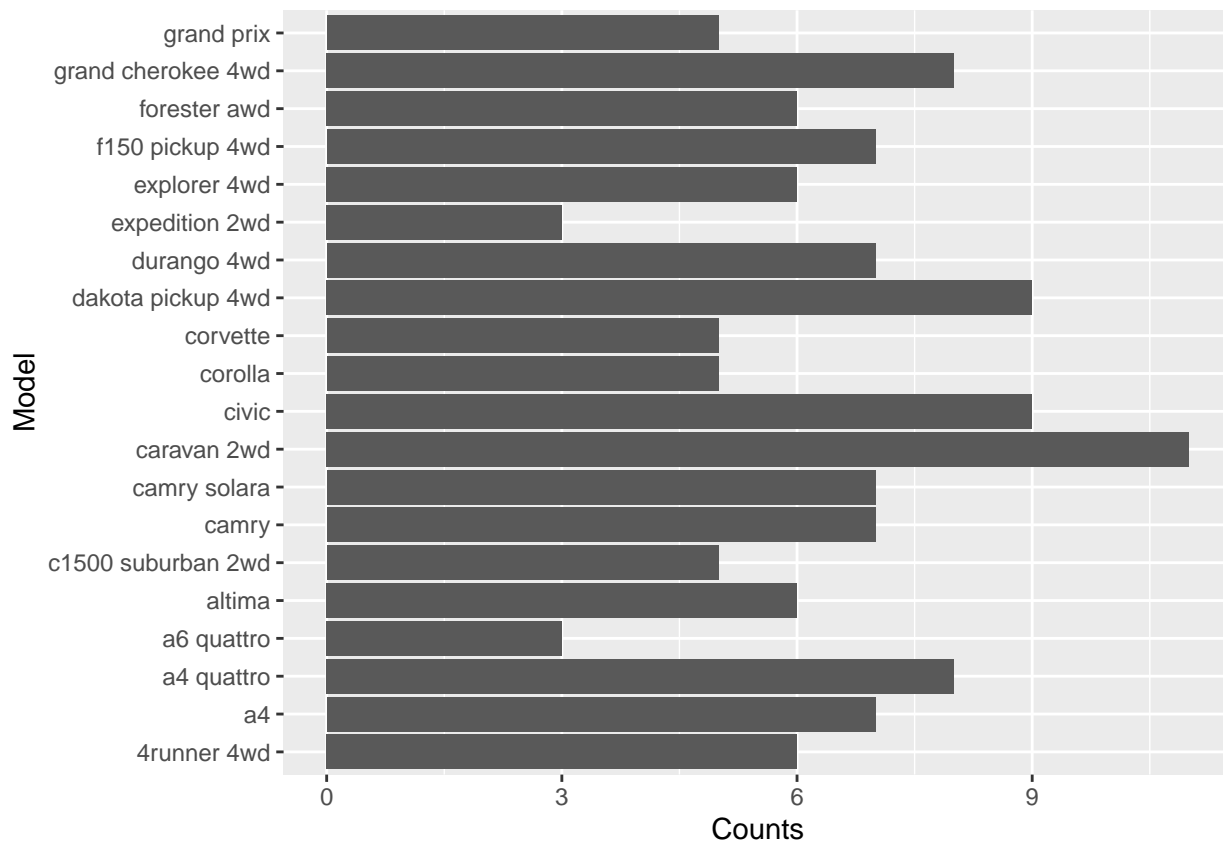
#5. Plot the relationship between cyl - number of cylinders and displ- engine displacement using geom_point with aesthetic colour = engine displacement.
#Title should be "Relationship between No. of Cylinders and Engine Displacement".

```
ggplot(data = mpg_dataset, mapping = aes(x = displ, y = cyl, main = "Relationship between No of Cylinder
        and Engine Displacement")) +
geom_point(mapping = aes(colour = "engine displacement"))
```
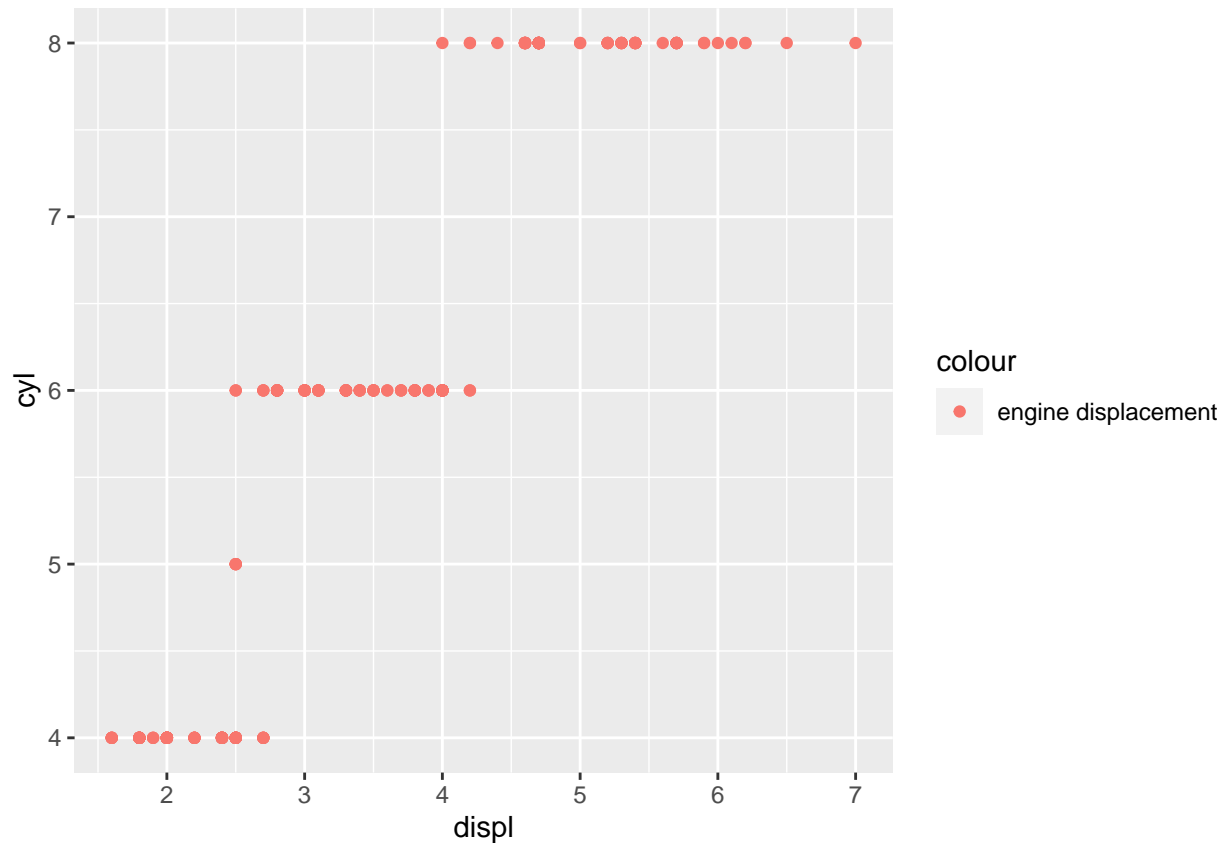
#b. How would you describe its relationship? #Answer: The cyl is in the y axis and the disp is in the x axis and can easily read the clustered data of which indicates the engine displacement.

#6. Get the total number of observations for drv - type of drive train #(f = front-wheel drive,r = rear wheel drive, 4 = 4wd) and class - type of class #(Example: suv, 2seater, etc.). Plot using the geom_tile() where the number of observations for #class be used as a fill for aesthetics.

#a. Show the codes and its result for the narrative in #6.

```
ggplot(data = mpg_dataset, mapping = aes(x = drv, y = class)) +
geom_tile(aes(fill = class))
```
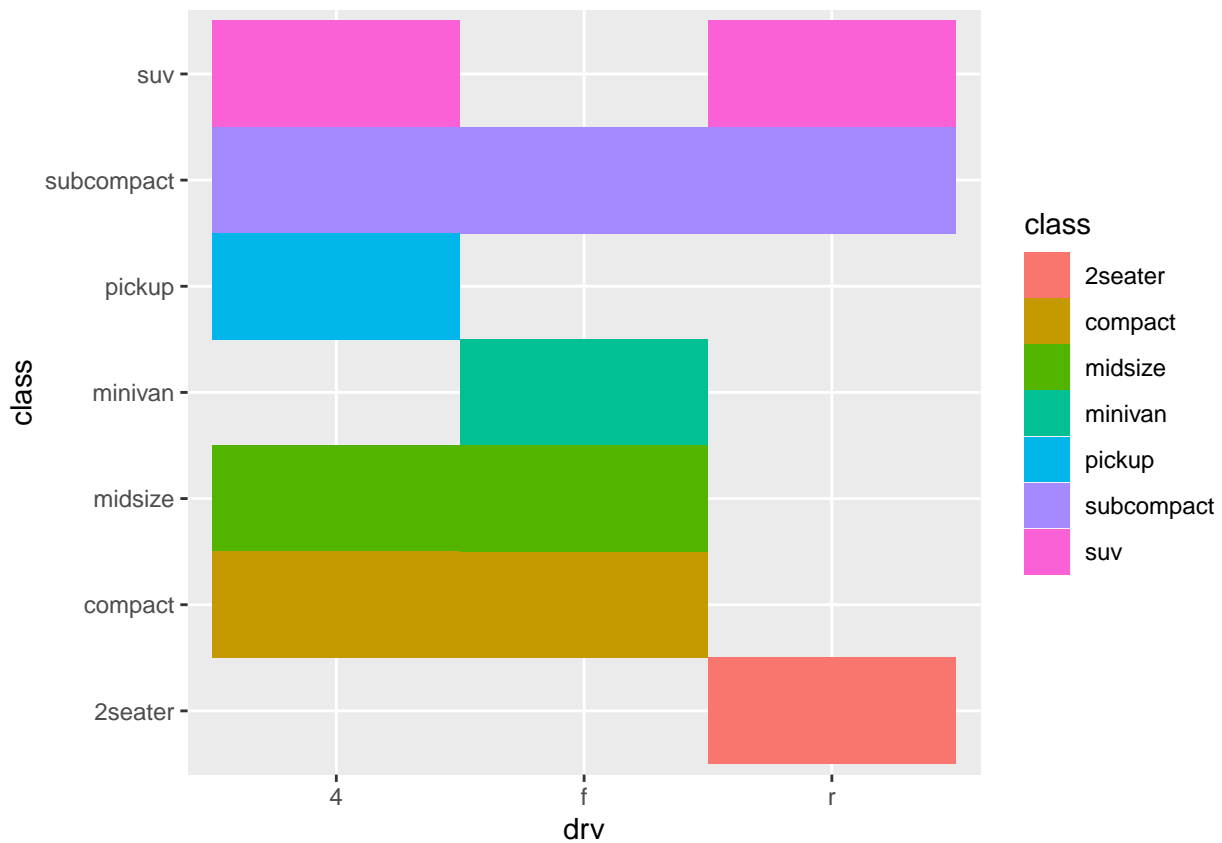
#b. Interpret the result.

#Answer: The y aixs is class and the x axis is drv. It graph and show the data. Specifically the data a

#7. Discuss the difference between these codes. Its outputs for each are shown below.

#Answer:The two code are the same. In the code it says that the colour is both
#blue but on the first code the result is color red and on the smaller graph.
#Unlike on the second code that the graph is much more larger than the first graph and the 3result is o

```
ggplot(data = mpg) +
geom_point(mapping = aes(x = displ, y = hwy, colour = "blue"))
```
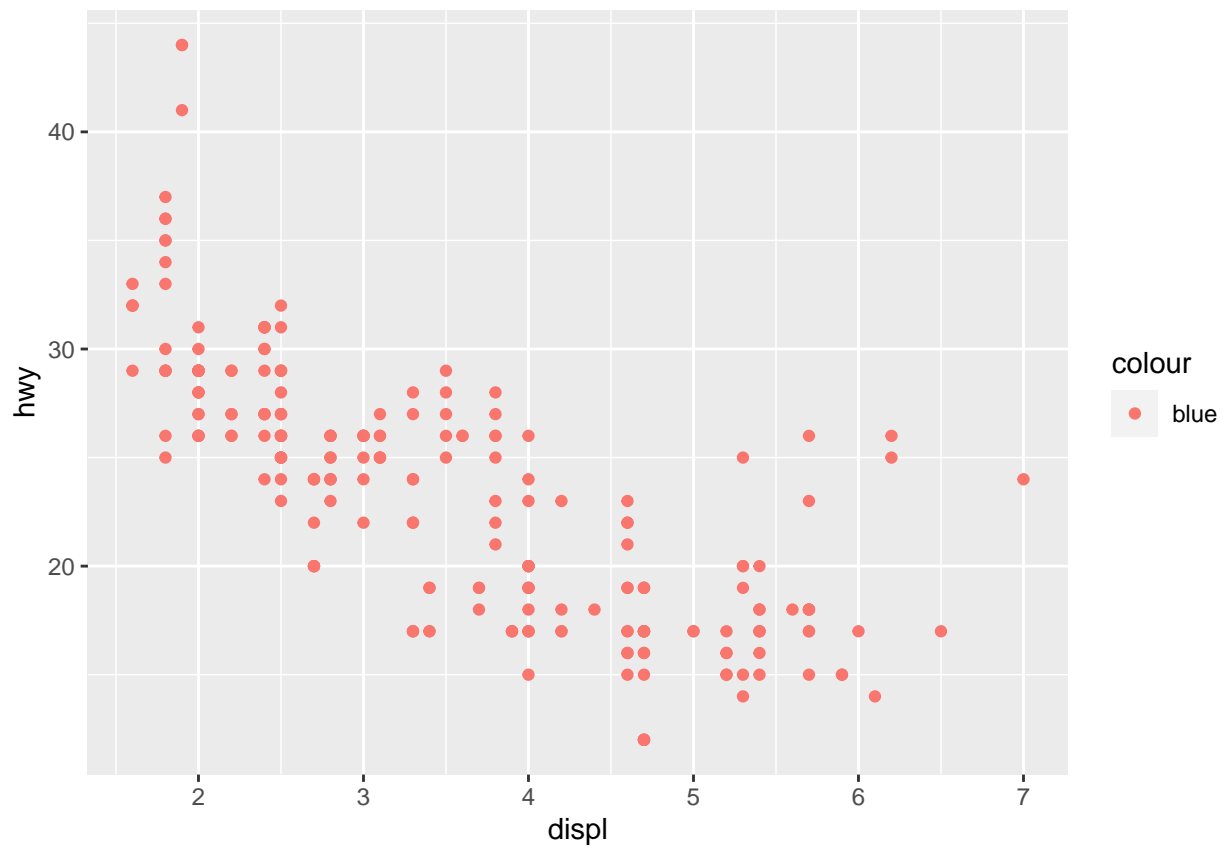
```
ggplot(data = mpg) +
geom_point(mapping = aes(x = displ, y = hwy), colour = "blue")
```
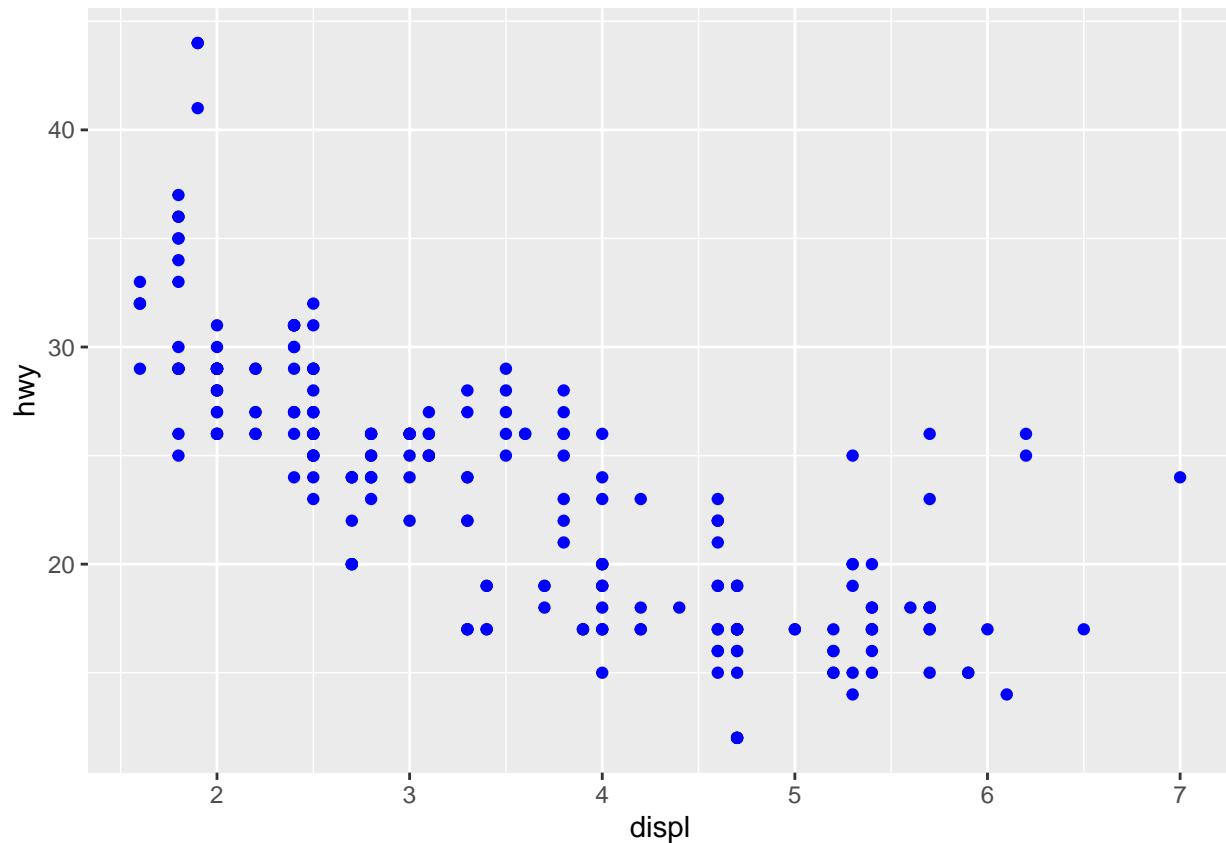
#8. Try to run the command ?mpg. What is the result of this command?

```
command <-? mpg
command
```

    #Answer: The result of the code is the description or the data set of mpg.

#a. Which variables from mpg dataset are categorical?

   #Answer: The Manufacturer, Model, Trans, drv, fl, class, cyl, cty, and hwy.

#b. Which are continuous variables?

    #Answer: displ, year, cyl, cty, and hwy.

#c. Plot the relationship between displ (engine displacement) and hwy(highway miles #per gallon). Mapped it with a continuous variable you have identified in #5-b.What is its result? Why it produced such output?

   #Answer: The result was graph and it shows that they are in the positive rate.

```
ggplot(mpg, aes(x = cty, y = hwy, colour = displ)) + geom_point()
```
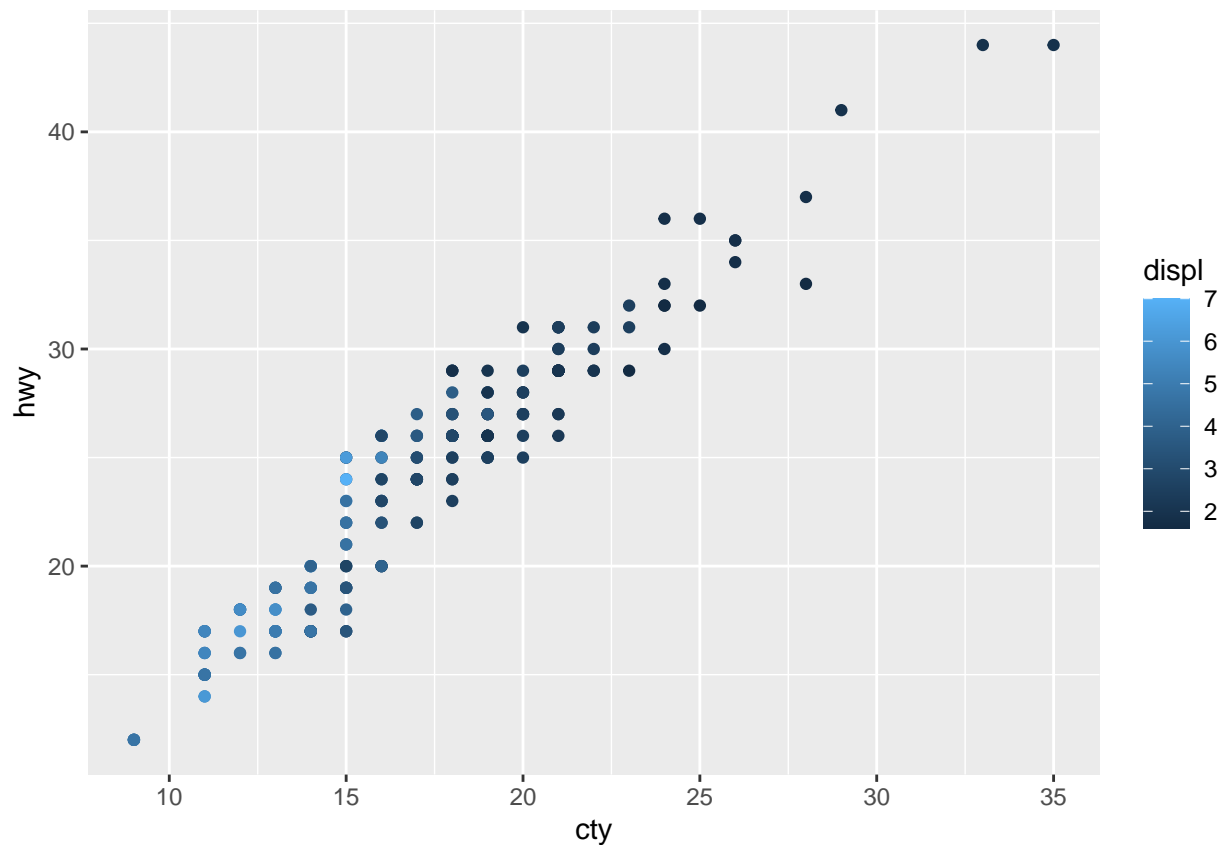
#9. Plot the relationship between displ (engine displacement) and hwy(highway miles #per gallon) using geom_point(). Add a trend line over the existing plot usinggeom_smooth() #with se = FALSE. Default method is "loess".

```
ggplot(data = mpg, mapping = aes(x = displ, y = hwy)) +
geom_point(mapping = aes(color = class)) +
geom_smooth(se = FALSE)
```

```
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'
```
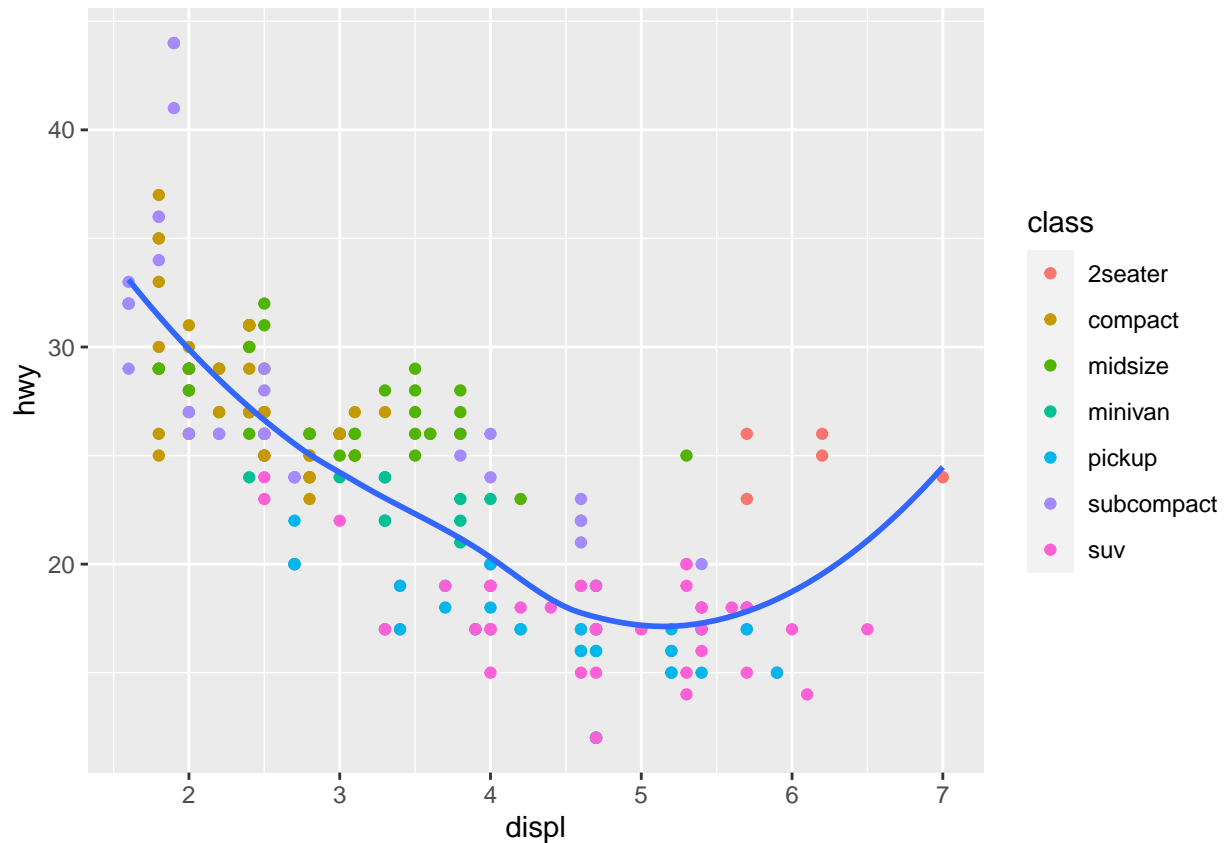
#10. Using the relationship of displ and hwy, add a trend line over existing plot. #Set the se = FALSE to remove the confidence interval and method = lm to check for linear modeling.

```
ggplot(data = mpg, mapping = aes(x = displ, y = hwy, color = class)) +
geom_point()+
geom_smooth(se = FALSE, method = lm)
```

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