RWorksheet_Lumauag#4c

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```r
#1
#a
library(readxl)
dataset <- read.csv ("C:/RPROJS/mpg.csv")
dataset
```

```
##      X manufacturer              model displ year cyl      trans drv cty
## 1    1         audi                 a4   1.8 1999   4  auto(l5)   f  18
## 2    2         audi                 a4   1.8 1999   4 manual(m5)   f  21
## 3    3         audi                 a4   2.0 2008   4 manual(m6)   f  20
## 4    4         audi                 a4   2.0 2008   4  auto(av)   f  21
## 5    5         audi                 a4   2.8 1999   6  auto(l5)   f  16
## 6    6         audi                 a4   2.8 1999   6 manual(m5)   f  18
## 7    7         audi                 a4   3.1 2008   6  auto(av)   f  18
## 8    8         audi          a4 quattro   1.8 1999   4 manual(m5)   4  18
## 9    9         audi          a4 quattro   1.8 1999   4  auto(l5)   4  16
## 10  10         audi          a4 quattro   2.0 2008   4 manual(m6)   4  20
## 11  11         audi          a4 quattro   2.0 2008   4  auto(s6)   4  19
## 12  12         audi          a4 quattro   2.8 1999   6  auto(l5)   4  15
## 13  13         audi          a4 quattro   2.8 1999   6 manual(m5)   4  17
## 14  14         audi          a4 quattro   3.1 2008   6  auto(s6)   4  17
## 15  15         audi          a4 quattro   3.1 2008   6 manual(m6)   4  15
## 16  16         audi          a6 quattro   2.8 1999   6  auto(l5)   4  15
## 17  17         audi          a6 quattro   3.1 2008   6  auto(s6)   4  17
## 18  18         audi          a6 quattro   4.2 2008   8  auto(s6)   4  16
## 19  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
## 21  21    chevrolet  c1500 suburban 2wd   5.3 2008   8  auto(l4)   r  14
## 22  22    chevrolet  c1500 suburban 2wd   5.7 1999   8  auto(l4)   r  13
## 23  23    chevrolet  c1500 suburban 2wd   6.0 2008   8  auto(l4)   r  12
## 24  24    chevrolet            corvette   5.7 1999   8 manual(m6)   r  16
## 25  25    chevrolet            corvette   5.7 1999   8  auto(l4)   r  15
## 26  26    chevrolet            corvette   6.2 2008   8 manual(m6)   r  16
## 27  27    chevrolet            corvette   6.2 2008   8  auto(s6)   r  15
## 28  28    chevrolet            corvette   7.0 2008   8 manual(m6)   r  15
## 29  29    chevrolet      k1500 tahoe 4wd   5.3 2008   8  auto(l4)   4  14
## 30  30    chevrolet      k1500 tahoe 4wd   5.3 2008   8  auto(l4)   4  11
## 31  31    chevrolet      k1500 tahoe 4wd   5.7 1999   8  auto(l4)   4  11
## 32  32    chevrolet      k1500 tahoe 4wd   6.5 1999   8  auto(l4)   4  14
## 33  33    chevrolet              malibu   2.4 1999   4  auto(l4)   f  19
## 34  34    chevrolet              malibu   2.4 2008   4  auto(l4)   f  22
## 35  35    chevrolet              malibu   3.1 1999   6  auto(l4)   f  18
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## 36 36     chevrolet                malibu 3.5 2008 6  auto(l4) f 18
## 37 37     chevrolet                malibu 3.6 2008 6  auto(s6) f 17
## 38 38        dodge           caravan 2wd 2.4 1999 4  auto(l3) f 18
## 39 39        dodge           caravan 2wd 3.0 1999 6  auto(l4) f 17
## 40 40        dodge           caravan 2wd 3.3 1999 6  auto(l4) f 16
## 41 41        dodge           caravan 2wd 3.3 1999 6  auto(l4) f 16
## 42 42        dodge           caravan 2wd 3.3 2008 6  auto(l4) f 17
## 43 43        dodge           caravan 2wd 3.3 2008 6  auto(l4) f 17
## 44 44        dodge           caravan 2wd 3.3 2008 6  auto(l4) f 11
## 45 45        dodge           caravan 2wd 3.8 1999 6  auto(l4) f 15
## 46 46        dodge           caravan 2wd 3.8 1999 6  auto(l4) f 15
## 47 47        dodge           caravan 2wd 3.8 2008 6  auto(l6) f 16
## 48 48        dodge           caravan 2wd 4.0 2008 6  auto(l6) f 16
## 49 49        dodge     dakota pickup 4wd 3.7 2008 6 manual(m6) 4 15
## 50 50        dodge     dakota pickup 4wd 3.7 2008 6  auto(l4) 4 14
## 51 51        dodge     dakota pickup 4wd 3.9 1999 6  auto(l4) 4 13
## 52 52        dodge     dakota pickup 4wd 3.9 1999 6 manual(m5) 4 14
## 53 53        dodge     dakota pickup 4wd 4.7 2008 8  auto(l5) 4 14
## 54 54        dodge     dakota pickup 4wd 4.7 2008 8  auto(l5) 4 14
## 55 55        dodge     dakota pickup 4wd 4.7 2008 8  auto(l5) 4  9
## 56 56        dodge     dakota pickup 4wd 5.2 1999 8 manual(m5) 4 11
## 57 57        dodge     dakota pickup 4wd 5.2 1999 8  auto(l4) 4 11
## 58 58        dodge           durango 4wd 3.9 1999 6  auto(l4) 4 13
## 59 59        dodge           durango 4wd 4.7 2008 8  auto(l5) 4 13
## 60 60        dodge           durango 4wd 4.7 2008 8  auto(l5) 4  9
## 61 61        dodge           durango 4wd 4.7 2008 8  auto(l5) 4 13
## 62 62        dodge           durango 4wd 5.2 1999 8  auto(l4) 4 11
## 63 63        dodge           durango 4wd 5.7 2008 8  auto(l5) 4 13
## 64 64        dodge           durango 4wd 5.9 1999 8  auto(l4) 4 11
## 65 65        dodge ram 1500 pickup 4wd 4.7 2008 8 manual(m6) 4 12
## 66 66        dodge ram 1500 pickup 4wd 4.7 2008 8  auto(l5) 4  9
## 67 67        dodge ram 1500 pickup 4wd 4.7 2008 8  auto(l5) 4 13
## 68 68        dodge ram 1500 pickup 4wd 4.7 2008 8  auto(l5) 4 13
## 69 69        dodge ram 1500 pickup 4wd 4.7 2008 8 manual(m6) 4 12
## 70 70        dodge ram 1500 pickup 4wd 4.7 2008 8 manual(m6) 4  9
## 71 71        dodge ram 1500 pickup 4wd 5.2 1999 8  auto(l4) 4 11
## 72 72        dodge ram 1500 pickup 4wd 5.2 1999 8 manual(m5) 4 11
## 73 73        dodge ram 1500 pickup 4wd 5.7 2008 8  auto(l5) 4 13
## 74 74        dodge ram 1500 pickup 4wd 5.9 1999 8  auto(l4) 4 11
## 75 75         ford        expedition 2wd 4.6 1999 8  auto(l4) r 11
## 76 76         ford        expedition 2wd 5.4 1999 8  auto(l4) r 11
## 77 77         ford        expedition 2wd 5.4 2008 8  auto(l6) r 12
## 78 78         ford           explorer 4wd 4.0 1999 6  auto(l5) 4 14
## 79 79         ford           explorer 4wd 4.0 1999 6 manual(m5) 4 15
## 80 80         ford           explorer 4wd 4.0 1999 6  auto(l5) 4 14
## 81 81         ford           explorer 4wd 4.0 2008 6  auto(l5) 4 13
## 82 82         ford           explorer 4wd 4.6 2008 8  auto(l6) 4 13
## 83 83         ford           explorer 4wd 5.0 1999 8  auto(l4) 4 13
## 84 84         ford         f150 pickup 4wd 4.2 1999 6  auto(l4) 4 14
## 85 85         ford         f150 pickup 4wd 4.2 1999 6 manual(m5) 4 14
## 86 86         ford         f150 pickup 4wd 4.6 1999 8 manual(m5) 4 13
## 87 87         ford         f150 pickup 4wd 4.6 1999 8  auto(l4) 4 13
## 88 88         ford         f150 pickup 4wd 4.6 2008 8  auto(l4) 4 13
## 89 89         ford         f150 pickup 4wd 5.4 1999 8  auto(l4) 4 11
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## 90   90       ford    f150 pickup 4wd  5.4 2008  8   auto(14)  4  13
## 91   91       ford            mustang  3.8 1999  6 manual(m5)  r  18
## 92   92       ford            mustang  3.8 1999  6   auto(14)  r  18
## 93   93       ford            mustang  4.0 2008  6 manual(m5)  r  17
## 94   94       ford            mustang  4.0 2008  6   auto(15)  r  16
## 95   95       ford            mustang  4.6 1999  8   auto(14)  r  15
## 96   96       ford            mustang  4.6 1999  8 manual(m5)  r  15
## 97   97       ford            mustang  4.6 2008  8 manual(m5)  r  15
## 98   98       ford            mustang  4.6 2008  8   auto(15)  r  15
## 99   99       ford            mustang  5.4 2008  8 manual(m6)  r  14
## 100 100      honda              civic  1.6 1999  4 manual(m5)  f  28
## 101 101      honda              civic  1.6 1999  4   auto(14)  f  24
## 102 102      honda              civic  1.6 1999  4 manual(m5)  f  25
## 103 103      honda              civic  1.6 1999  4 manual(m5)  f  23
## 104 104      honda              civic  1.6 1999  4   auto(14)  f  24
## 105 105      honda              civic  1.8 2008  4 manual(m5)  f  26
## 106 106      honda              civic  1.8 2008  4   auto(15)  f  25
## 107 107      honda              civic  1.8 2008  4   auto(15)  f  24
## 108 108      honda              civic  2.0 2008  4 manual(m6)  f  21
## 109 109    hyundai             sonata  2.4 1999  4   auto(14)  f  18
## 110 110    hyundai             sonata  2.4 1999  4 manual(m5)  f  18
## 111 111    hyundai             sonata  2.4 2008  4   auto(14)  f  21
## 112 112    hyundai             sonata  2.4 2008  4 manual(m5)  f  21
## 113 113    hyundai             sonata  2.5 1999  6   auto(14)  f  18
## 114 114    hyundai             sonata  2.5 1999  6 manual(m5)  f  18
## 115 115    hyundai             sonata  3.3 2008  6   auto(15)  f  19
## 116 116    hyundai            tiburon  2.0 1999  4   auto(14)  f  19
## 117 117    hyundai            tiburon  2.0 1999  4 manual(m5)  f  19
## 118 118    hyundai            tiburon  2.0 2008  4 manual(m5)  f  20
## 119 119    hyundai            tiburon  2.0 2008  4   auto(14)  f  20
## 120 120    hyundai            tiburon  2.7 2008  6   auto(14)  f  17
## 121 121    hyundai            tiburon  2.7 2008  6 manual(m6)  f  16
## 122 122    hyundai            tiburon  2.7 2008  6 manual(m5)  f  17
## 123 123       jeep  grand cherokee 4wd  3.0 2008  6   auto(15)  4  17
## 124 124       jeep  grand cherokee 4wd  3.7 2008  6   auto(15)  4  15
## 125 125       jeep  grand cherokee 4wd  4.0 1999  6   auto(14)  4  15
## 126 126       jeep  grand cherokee 4wd  4.7 1999  8   auto(14)  4  14
## 127 127       jeep  grand cherokee 4wd  4.7 2008  8   auto(15)  4   9
## 128 128       jeep  grand cherokee 4wd  4.7 2008  8   auto(15)  4  14
## 129 129       jeep  grand cherokee 4wd  5.7 2008  8   auto(15)  4  13
## 130 130       jeep  grand cherokee 4wd  6.1 2008  8   auto(15)  4  11
## 131 131 land rover        range rover  4.0 1999  8   auto(14)  4  11
## 132 132 land rover        range rover  4.2 2008  8   auto(s6)  4  12
## 133 133 land rover        range rover  4.4 2008  8   auto(s6)  4  12
## 134 134 land rover        range rover  4.6 1999  8   auto(14)  4  11
## 135 135    lincoln       navigator 2wd  5.4 1999  8   auto(14)  r  11
## 136 136    lincoln       navigator 2wd  5.4 1999  8   auto(14)  r  11
## 137 137    lincoln       navigator 2wd  5.4 2008  8   auto(16)  r  12
## 138 138    mercury     mountaineer 4wd  4.0 1999  6   auto(15)  4  14
## 139 139    mercury     mountaineer 4wd  4.0 2008  6   auto(15)  4  13
## 140 140    mercury     mountaineer 4wd  4.6 2008  8   auto(16)  4  13
## 141 141    mercury     mountaineer 4wd  5.0 1999  8   auto(14)  4  13
## 142 142     nissan             altima  2.4 1999  4 manual(m5)  f  21
## 143 143     nissan             altima  2.4 1999  4   auto(14)  f  19
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## 144 144      nissan                    altima  2.5 2008   4    auto(av)   f   23
## 145 145      nissan                    altima  2.5 2008   4 manual(m6)   f   23
## 146 146      nissan                    altima  3.5 2008   6 manual(m6)   f   19
## 147 147      nissan                    altima  3.5 2008   6    auto(av)   f   19
## 148 148      nissan                    maxima  3.0 1999   6    auto(14)   f   18
## 149 149      nissan                    maxima  3.0 1999   6 manual(m5)   f   19
## 150 150      nissan                    maxima  3.5 2008   6    auto(av)   f   19
## 151 151      nissan             pathfinder 4wd  3.3 1999   6    auto(14)   4   14
## 152 152      nissan             pathfinder 4wd  3.3 1999   6 manual(m5)   4   15
## 153 153      nissan             pathfinder 4wd  4.0 2008   6    auto(15)   4   14
## 154 154      nissan             pathfinder 4wd  5.6 2008   8    auto(s5)   4   12
## 155 155     pontiac                grand prix  3.1 1999   6    auto(14)   f   18
## 156 156     pontiac                grand prix  3.8 1999   6    auto(14)   f   16
## 157 157     pontiac                grand prix  3.8 1999   6    auto(14)   f   17
## 158 158     pontiac                grand prix  3.8 2008   6    auto(14)   f   18
## 159 159     pontiac                grand prix  5.3 2008   8    auto(s4)   f   16
## 160 160      subaru              forester awd  2.5 1999   4 manual(m5)   4   18
## 161 161      subaru              forester awd  2.5 1999   4    auto(14)   4   18
## 162 162      subaru              forester awd  2.5 2008   4 manual(m5)   4   20
## 163 163      subaru              forester awd  2.5 2008   4 manual(m5)   4   19
## 164 164      subaru              forester awd  2.5 2008   4    auto(14)   4   20
## 165 165      subaru              forester awd  2.5 2008   4    auto(14)   4   18
## 166 166      subaru               impreza awd  2.2 1999   4    auto(14)   4   21
## 167 167      subaru               impreza awd  2.2 1999   4 manual(m5)   4   19
## 168 168      subaru               impreza awd  2.5 1999   4 manual(m5)   4   19
## 169 169      subaru               impreza awd  2.5 1999   4    auto(14)   4   19
## 170 170      subaru               impreza awd  2.5 2008   4    auto(s4)   4   20
## 171 171      subaru               impreza awd  2.5 2008   4    auto(s4)   4   20
## 172 172      subaru               impreza awd  2.5 2008   4 manual(m5)   4   19
## 173 173      subaru               impreza awd  2.5 2008   4 manual(m5)   4   20
## 174 174      toyota                4runner 4wd  2.7 1999   4 manual(m5)   4   15
## 175 175      toyota                4runner 4wd  2.7 1999   4    auto(14)   4   16
## 176 176      toyota                4runner 4wd  3.4 1999   6    auto(14)   4   15
## 177 177      toyota                4runner 4wd  3.4 1999   6 manual(m5)   4   15
## 178 178      toyota                4runner 4wd  4.0 2008   6    auto(15)   4   16
## 179 179      toyota                4runner 4wd  4.7 2008   8    auto(15)   4   14
## 180 180      toyota                     camry  2.2 1999   4 manual(m5)   f   21
## 181 181      toyota                     camry  2.2 1999   4    auto(14)   f   21
## 182 182      toyota                     camry  2.4 2008   4 manual(m5)   f   21
## 183 183      toyota                     camry  2.4 2008   4    auto(15)   f   21
## 184 184      toyota                     camry  3.0 1999   6    auto(14)   f   18
## 185 185      toyota                     camry  3.0 1999   6 manual(m5)   f   18
## 186 186      toyota                     camry  3.5 2008   6    auto(s6)   f   19
## 187 187      toyota              camry solara  2.2 1999   4    auto(14)   f   21
## 188 188      toyota              camry solara  2.2 1999   4 manual(m5)   f   21
## 189 189      toyota              camry solara  2.4 2008   4 manual(m5)   f   21
## 190 190      toyota              camry solara  2.4 2008   4    auto(s5)   f   22
## 191 191      toyota              camry solara  3.0 1999   6    auto(14)   f   18
## 192 192      toyota              camry solara  3.0 1999   6 manual(m5)   f   18
## 193 193      toyota              camry solara  3.3 2008   6    auto(s5)   f   18
## 194 194      toyota                   corolla  1.8 1999   4    auto(13)   f   24
## 195 195      toyota                   corolla  1.8 1999   4    auto(14)   f   24
## 196 196      toyota                   corolla  1.8 1999   4 manual(m5)   f   26
## 197 197      toyota                   corolla  1.8 2008   4 manual(m5)   f   28
```

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## 198 198        toyota              corolla 1.8 2008  4   auto(l4) f 26
## 199 199        toyota land cruiser wagon 4wd 4.7 1999  8   auto(l4) 4 11
## 200 200        toyota land cruiser wagon 4wd 5.7 2008  8   auto(s6) 4 13
## 201 201        toyota    toyota tacoma 4wd 2.7 1999  4 manual(m5) 4 15
## 202 202        toyota    toyota tacoma 4wd 2.7 1999  4   auto(l4) 4 16
## 203 203        toyota    toyota tacoma 4wd 2.7 2008  4 manual(m5) 4 17
## 204 204        toyota    toyota tacoma 4wd 3.4 1999  6 manual(m5) 4 15
## 205 205        toyota    toyota tacoma 4wd 3.4 1999  6   auto(l4) 4 15
## 206 206        toyota    toyota tacoma 4wd 4.0 2008  6 manual(m6) 4 15
## 207 207        toyota    toyota tacoma 4wd 4.0 2008  6   auto(l5) 4 16
## 208 208    volkswagen              gti 2.0 1999  4 manual(m5) f 21
## 209 209    volkswagen              gti 2.0 1999  4   auto(l4) f 19
## 210 210    volkswagen              gti 2.0 2008  4 manual(m6) f 21
## 211 211    volkswagen              gti 2.0 2008  4   auto(s6) f 22
## 212 212    volkswagen              gti 2.8 1999  6 manual(m5) f 17
## 213 213    volkswagen             jetta 1.9 1999  4 manual(m5) f 33
## 214 214    volkswagen             jetta 2.0 1999  4 manual(m5) f 21
## 215 215    volkswagen             jetta 2.0 1999  4   auto(l4) f 19
## 216 216    volkswagen             jetta 2.0 2008  4   auto(s6) f 22
## 217 217    volkswagen             jetta 2.0 2008  4 manual(m6) f 21
## 218 218    volkswagen             jetta 2.5 2008  5   auto(s6) f 21
## 219 219    volkswagen             jetta 2.5 2008  5 manual(m5) f 21
## 220 220    volkswagen             jetta 2.8 1999  6   auto(l4) f 16
## 221 221    volkswagen             jetta 2.8 1999  6 manual(m5) f 17
## 222 222    volkswagen        new beetle 1.9 1999  4 manual(m5) f 35
## 223 223    volkswagen        new beetle 1.9 1999  4   auto(l4) f 29
## 224 224    volkswagen        new beetle 2.0 1999  4 manual(m5) f 21
## 225 225    volkswagen        new beetle 2.0 1999  4   auto(l4) f 19
## 226 226    volkswagen        new beetle 2.5 2008  5 manual(m5) f 20
## 227 227    volkswagen        new beetle 2.5 2008  5   auto(s6) f 20
## 228 228    volkswagen            passat 1.8 1999  4 manual(m5) f 21
## 229 229    volkswagen            passat 1.8 1999  4   auto(l5) f 18
## 230 230    volkswagen            passat 2.0 2008  4   auto(s6) f 19
## 231 231    volkswagen            passat 2.0 2008  4 manual(m6) f 21
## 232 232    volkswagen            passat 2.8 1999  6   auto(l5) f 16
## 233 233    volkswagen            passat 2.8 1999  6 manual(m5) f 18
## 234 234    volkswagen            passat 3.6 2008  6   auto(s6) f 17
##      hwy fl    class
## 1     29  p  compact
## 2     29  p  compact
## 3     31  p  compact
## 4     30  p  compact
## 5     26  p  compact
## 6     26  p  compact
## 7     27  p  compact
## 8     26  p  compact
## 9     25  p  compact
## 10    28  p  compact
## 11    27  p  compact
## 12    25  p  compact
## 13    25  p  compact
## 14    25  p  compact
## 15    25  p  compact
## 16    24  p  midsize
```

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## 17    25    p      midsize
## 18    23    p      midsize
## 19    20    r         suv
## 20    15    e         suv
## 21    20    r         suv
## 22    17    r         suv
## 23    17    r         suv
## 24    26    p     2seater
## 25    23    p     2seater
## 26    26    p     2seater
## 27    25    p     2seater
## 28    24    p     2seater
## 29    19    r         suv
## 30    14    e         suv
## 31    15    r         suv
## 32    17    d         suv
## 33    27    r      midsize
## 34    30    r      midsize
## 35    26    r      midsize
## 36    29    r      midsize
## 37    26    r      midsize
## 38    24    r      minivan
## 39    24    r      minivan
## 40    22    r      minivan
## 41    22    r      minivan
## 42    24    r      minivan
## 43    24    r      minivan
## 44    17    e      minivan
## 45    22    r      minivan
## 46    21    r      minivan
## 47    23    r      minivan
## 48    23    r      minivan
## 49    19    r      pickup
## 50    18    r      pickup
## 51    17    r      pickup
## 52    17    r      pickup
## 53    19    r      pickup
## 54    19    r      pickup
## 55    12    e      pickup
## 56    17    r      pickup
## 57    15    r      pickup
## 58    17    r         suv
## 59    17    r         suv
## 60    12    e         suv
## 61    17    r         suv
## 62    16    r         suv
## 63    18    r         suv
## 64    15    r         suv
## 65    16    r      pickup
## 66    12    e      pickup
## 67    17    r      pickup
## 68    17    r      pickup
## 69    16    r      pickup
## 70    12    e      pickup
```

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## 71   15  r      pickup
## 72   16  r      pickup
## 73   17  r      pickup
## 74   15  r      pickup
## 75   17  r         suv
## 76   17  r         suv
## 77   18  r         suv
## 78   17  r         suv
## 79   19  r         suv
## 80   17  r         suv
## 81   19  r         suv
## 82   19  r         suv
## 83   17  r         suv
## 84   17  r      pickup
## 85   17  r      pickup
## 86   16  r      pickup
## 87   16  r      pickup
## 88   17  r      pickup
## 89   15  r      pickup
## 90   17  r      pickup
## 91   26  r subcompact
## 92   25  r subcompact
## 93   26  r subcompact
## 94   24  r subcompact
## 95   21  r subcompact
## 96   22  r subcompact
## 97   23  r subcompact
## 98   22  r subcompact
## 99   20  p subcompact
## 100  33  r subcompact
## 101  32  r subcompact
## 102  32  r subcompact
## 103  29  p subcompact
## 104  32  r subcompact
## 105  34  r subcompact
## 106  36  r subcompact
## 107  36  c subcompact
## 108  29  p subcompact
## 109  26  r      midsize
## 110  27  r      midsize
## 111  30  r      midsize
## 112  31  r      midsize
## 113  26  r      midsize
## 114  26  r      midsize
## 115  28  r      midsize
## 116  26  r subcompact
## 117  29  r subcompact
## 118  28  r subcompact
## 119  27  r subcompact
## 120  24  r subcompact
## 121  24  r subcompact
## 122  24  r subcompact
## 123  22  d         suv
## 124  19  r         suv
```

```
## 125 20 r       suv
## 126 17 r       suv
## 127 12 e       suv
## 128 19 r       suv
## 129 18 r       suv
## 130 14 p       suv
## 131 15 p       suv
## 132 18 r       suv
## 133 18 r       suv
## 134 15 p       suv
## 135 17 r       suv
## 136 16 p       suv
## 137 18 r       suv
## 138 17 r       suv
## 139 19 r       suv
## 140 19 r       suv
## 141 17 r       suv
## 142 29 r   compact
## 143 27 r   compact
## 144 31 r   midsize
## 145 32 r   midsize
## 146 27 p   midsize
## 147 26 p   midsize
## 148 26 r   midsize
## 149 25 r   midsize
## 150 25 p   midsize
## 151 17 r       suv
## 152 17 r       suv
## 153 20 p       suv
## 154 18 p       suv
## 155 26 r   midsize
## 156 26 p   midsize
## 157 27 r   midsize
## 158 28 r   midsize
## 159 25 p   midsize
## 160 25 r       suv
## 161 24 r       suv
## 162 27 r       suv
## 163 25 p       suv
## 164 26 r       suv
## 165 23 p       suv
## 166 26 r subcompact
## 167 26 r subcompact
## 168 26 r subcompact
## 169 26 r subcompact
## 170 25 p   compact
## 171 27 r   compact
## 172 25 p   compact
## 173 27 r   compact
## 174 20 r       suv
## 175 20 r       suv
## 176 19 r       suv
## 177 17 r       suv
## 178 20 r       suv
```

```
## 179 17  r        suv
## 180 29  r     midsize
## 181 27  r     midsize
## 182 31  r     midsize
## 183 31  r     midsize
## 184 26  r     midsize
## 185 26  r     midsize
## 186 28  r     midsize
## 187 27  r     compact
## 188 29  r     compact
## 189 31  r     compact
## 190 31  r     compact
## 191 26  r     compact
## 192 26  r     compact
## 193 27  r     compact
## 194 30  r     compact
## 195 33  r     compact
## 196 35  r     compact
## 197 37  r     compact
## 198 35  r     compact
## 199 15  r        suv
## 200 18  r        suv
## 201 20  r      pickup
## 202 20  r      pickup
## 203 22  r      pickup
## 204 17  r      pickup
## 205 19  r      pickup
## 206 18  r      pickup
## 207 20  r      pickup
## 208 29  r     compact
## 209 26  r     compact
## 210 29  p     compact
## 211 29  p     compact
## 212 24  r     compact
## 213 44  d     compact
## 214 29  r     compact
## 215 26  r     compact
## 216 29  p     compact
## 217 29  p     compact
## 218 29  r     compact
## 219 29  r     compact
## 220 23  r     compact
## 221 24  r     compact
## 222 44  d subcompact
## 223 41  d subcompact
## 224 29  r subcompact
## 225 26  r subcompact
## 226 28  r subcompact
## 227 29  r subcompact
## 228 29  p     midsize
## 229 29  p     midsize
## 230 28  p     midsize
## 231 29  p     midsize
## 232 26  p     midsize
```

```
## 233  26  p    midsize
## 234  26  p    midsize
```

```r
#b
#The categorical variables in the mpg dataset are manufacturer, model, trans, drv, fl, and class.
```

```r
#c
#The continuous variables in the mpg dataset are displ, cty, and hwy.
```

```r
#2
#The manufacturer with the most models in this dataset is Toyota, with 6 unique models. The model with
#a
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
```

```r
manufacturer_model_count <- dataset %>%
  group_by(manufacturer) %>%
  summarise(unique_models = n_distinct(model)) %>%
  arrange(desc(unique_models))

manufacturer_model_count
```

```
## # A tibble: 15 x 2
##     manufacturer unique_models
##     <chr>                <int>
##  1 toyota                   6
##  2 chevrolet                4
##  3 dodge                    4
##  4 ford                     4
##  5 volkswagen               4
##  6 audi                     3
##  7 nissan                   3
##  8 hyundai                  2
##  9 subaru                   2
## 10 honda                    1
## 11 jeep                     1
## 12 land rover               1
## 13 lincoln                  1
## 14 mercury                  1
## 15 pontiac                  1
```

```
#b
ggplot(manufacturer_model_count, aes(x = reorder(manufacturer, -unique_models), y = unique_models)) +
  geom_bar(stat = "identity", fill = "lightblue") +
  labs(title = "Unique Models by Manufacturer", x = "Manufacturer", y = "Count") + theme(axis.text.x =
```


Unique Models by Manufacturer
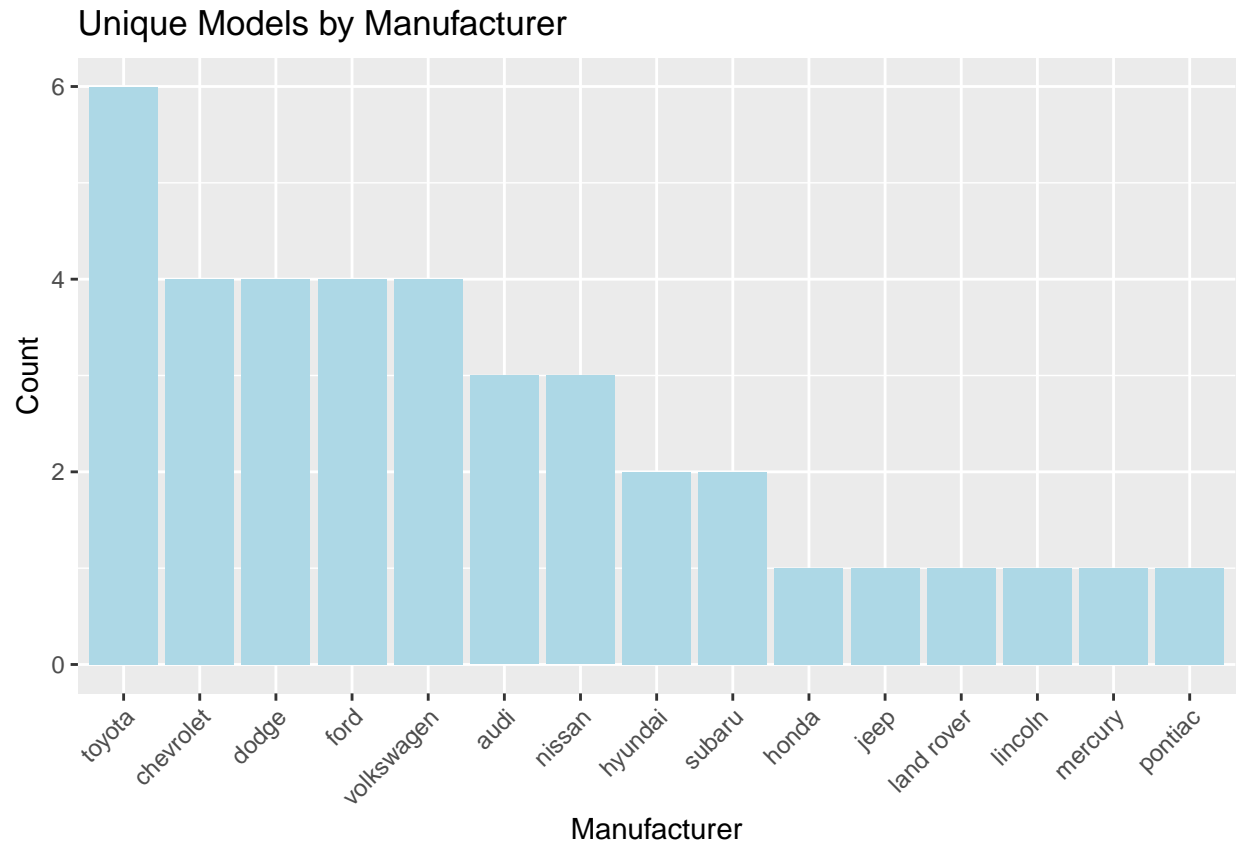
```
#2
#a
ggplot(mpg, aes(model, manufacturer)) + geom_point()
```
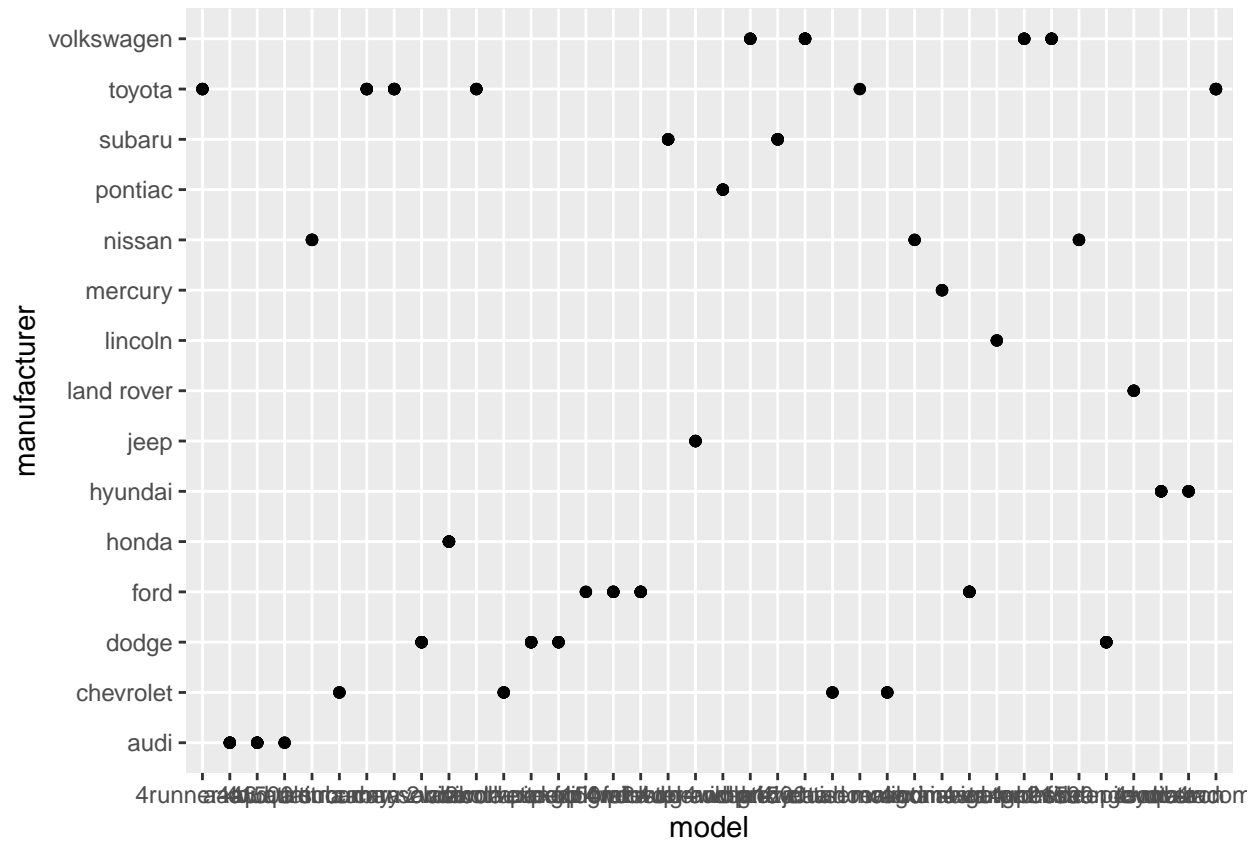
```
#b
#It is useful but the x-axis have too many categories, making the plot cluttered and unreadable.

#3
library(ggplot2)
library(dplyr)

top20data <- dataset %>% head(20)

ggplot(top20data, aes(x = model, y = year)) +
  geom_point() +
  labs(title = "Top 20 Car Models by Year") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

Top 20 Car Models by Year
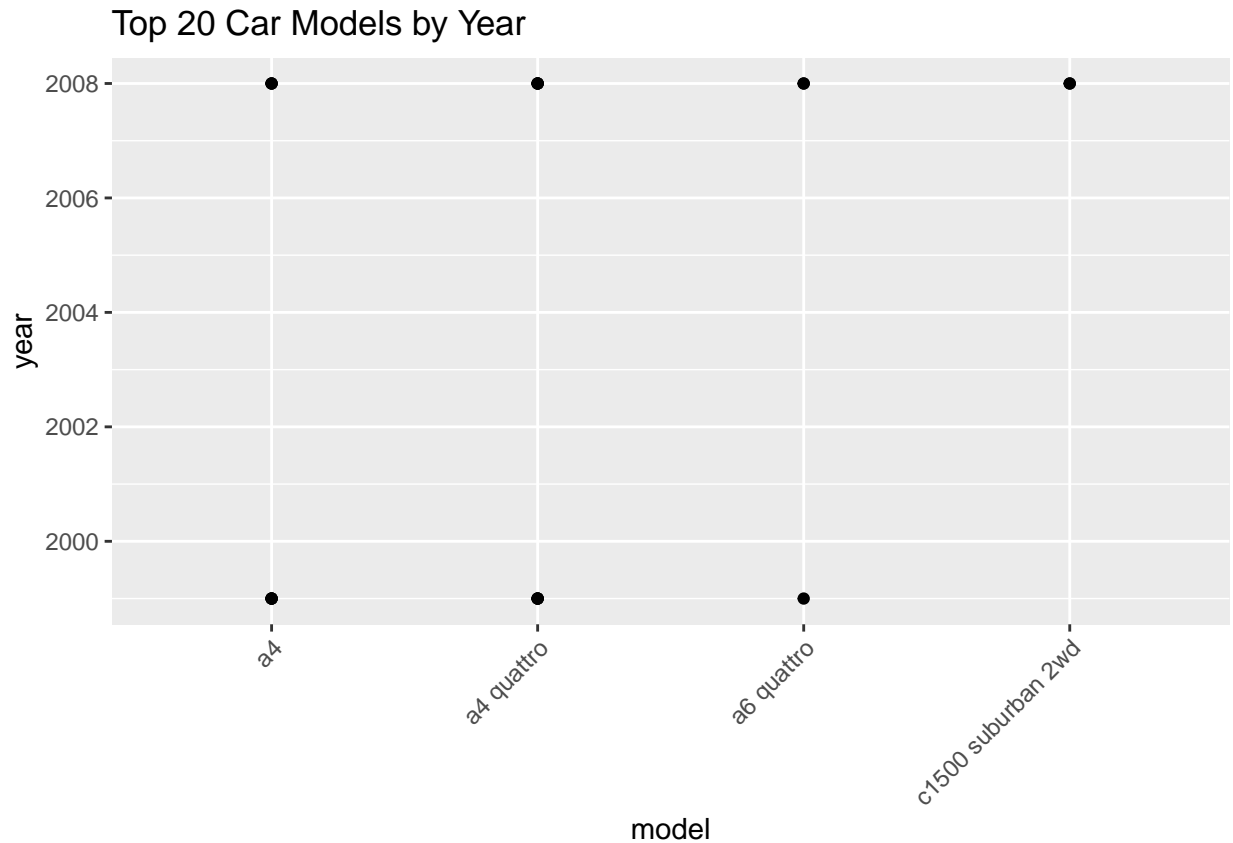

```
#4
modelcount <- dataset %>%
  group_by(model) %>%
  summarise(car_count = n())

modelcount
```

```
## # A tibble: 38 x 2
##    model            car_count
##    <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
## # i 28 more rows
```

```
#a
top_20_models <- modelcount %>% top_n(20, car_count)
```

```
ggplot(top_20_models, aes(x = reorder(model, car_count), y = car_count, fill = model)) +
  geom_bar(stat = "identity") +
  labs(title = "Top 20 Car Models by Count (Flipped)",
       x = "Car Model",
       y = "Count")
```


Top 20 Car Models by Count (Flipped)
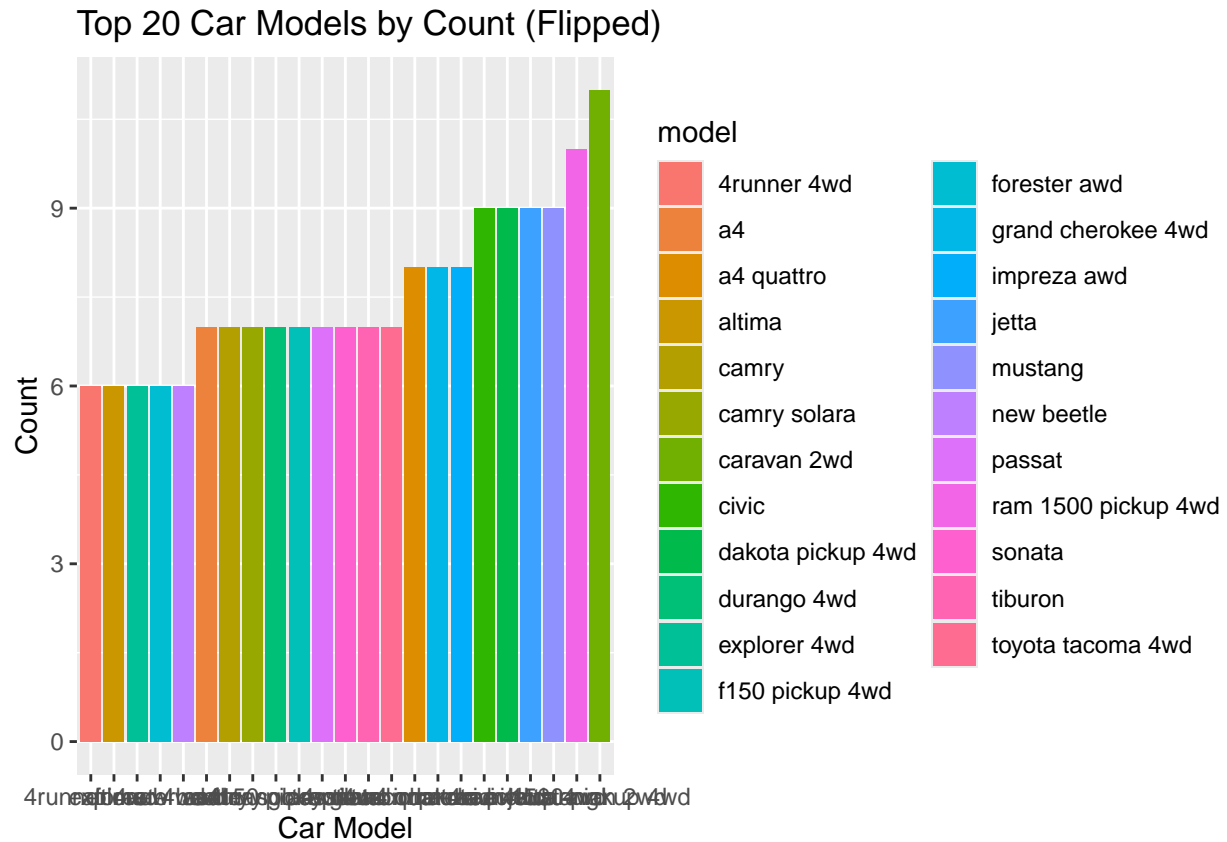
```
#b
ggplot(top_20_models, aes(x = reorder(model, car_count), y = car_count, fill = model)) +
  geom_bar(stat = "identity") +
  labs(title = "Top 20 Car Models by Count",
       x = "Car Model",
       y = "Count") + coord_flip()
```

Top 20 Car Models by Count
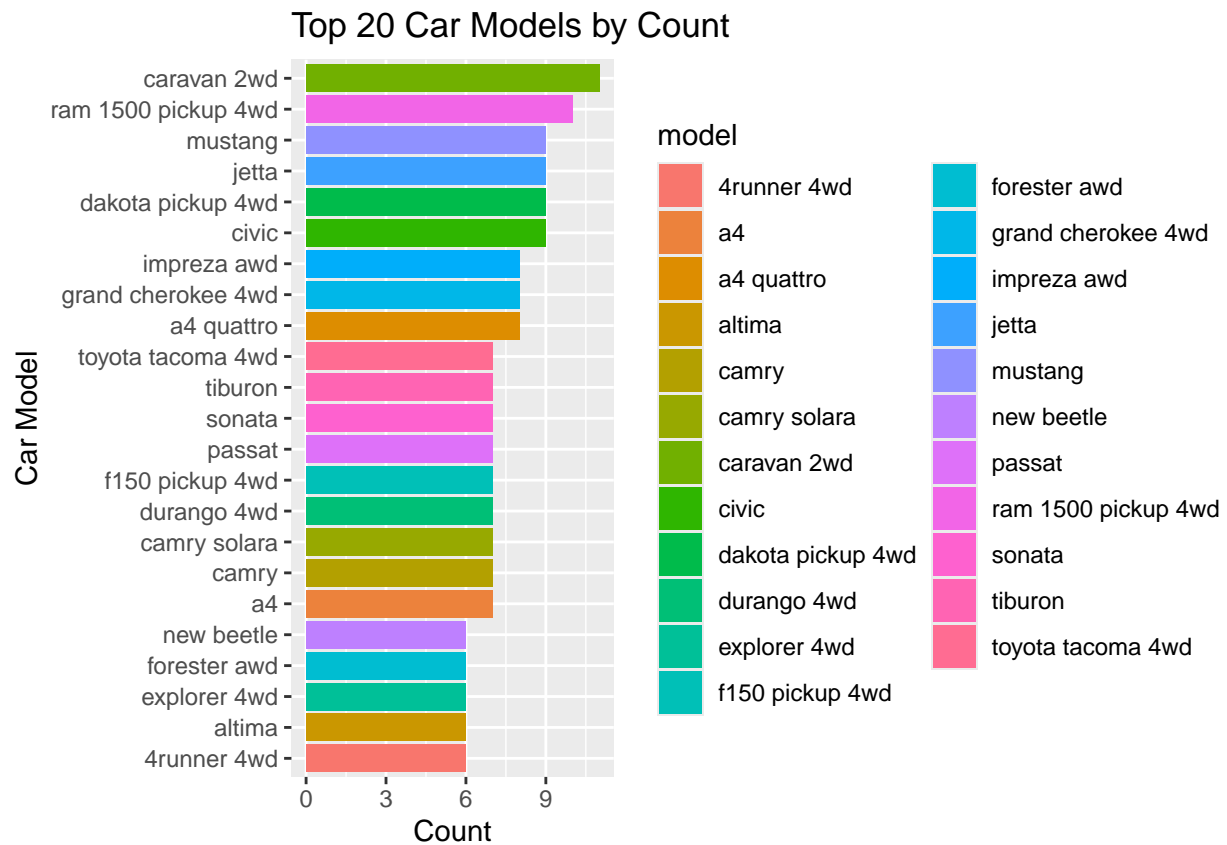

```
#5
#a
#I observed that points with higher cylinder counts (cyl) align with higher values of engine displaceme

ggplot(dataset, aes(x = cyl, y = displ, color = displ)) +
  geom_point() +
  labs(title = "Relationship between No. of Cylinders and Engine Displacement",
       x = "Number of Cylinders",
       y = "Engine Displacement (L)")
```

Relationship between No. of Cylinders and Engine Displacement
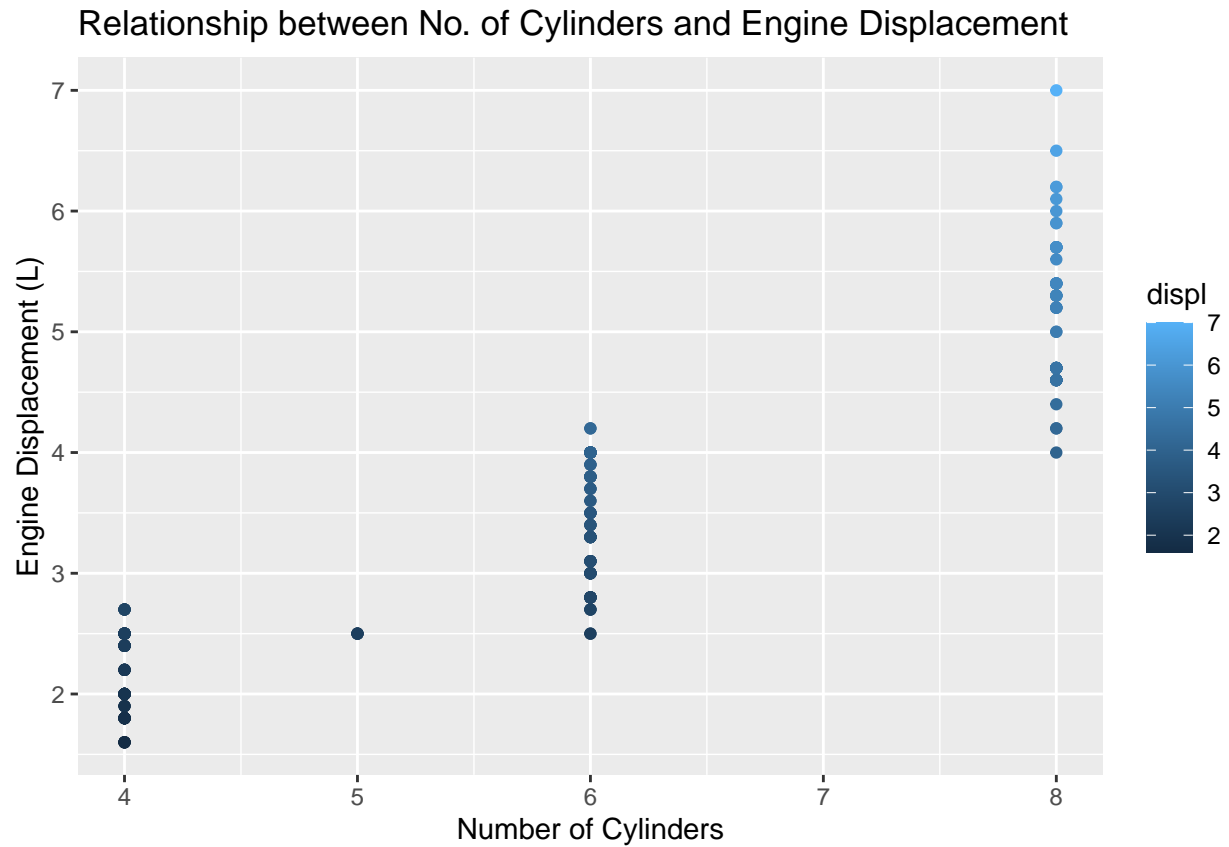

```
#6
ggplot(dataset, aes(x = displ, y = hwy, color = cyl)) +
  geom_point() +
  labs(title = "Relationship between Engine Displacement and Highway MPG",
       x = "Engine Displacement (L)",
       y = "Highway MPG")
```

Relationship between Engine Displacement and Highway MPG
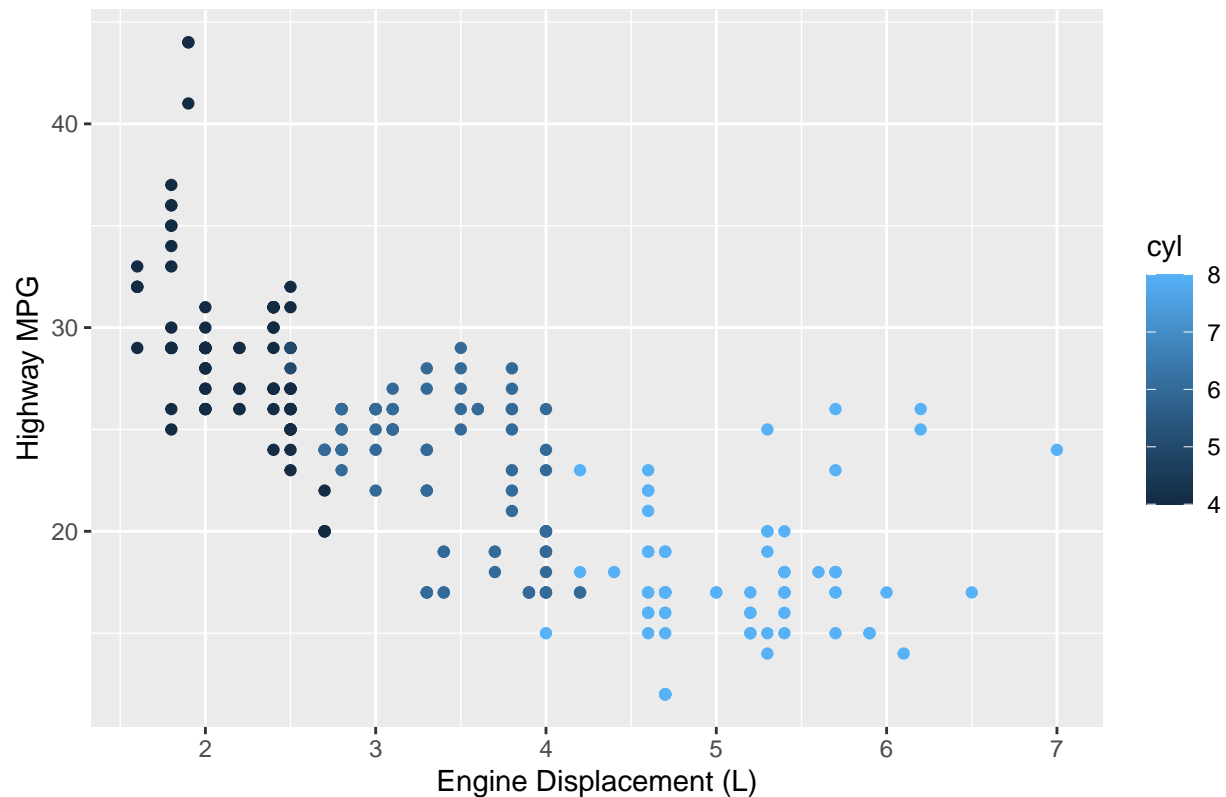

```
#7
library(readxl)
alexa_file <- read_excel("C:/RPROJS/alexa_file.xlsx")
alexa_file
```

```
## # A tibble: 3,150 x 5
##    rating date                variation          verified_reviews      feedback
##     <dbl> <dttm>              <chr>              <chr>                    <dbl>
##  1      5 2018-07-31 00:00:00 Charcoal Fabric    Love my Echo!                1
##  2      5 2018-07-31 00:00:00 Charcoal Fabric    Loved it!                    1
##  3      4 2018-07-31 00:00:00 Walnut Finish      Sometimes while play~        1
##  4      5 2018-07-31 00:00:00 Charcoal Fabric    I have had a lot of ~        1
##  5      5 2018-07-31 00:00:00 Charcoal Fabric    Music                        1
##  6      5 2018-07-31 00:00:00 Heather Gray Fabric I received the echo ~       1
##  7      3 2018-07-31 00:00:00 Sandstone Fabric   Without having a cel~        1
##  8      5 2018-07-31 00:00:00 Charcoal Fabric    I think this is the ~        1
##  9      5 2018-07-30 00:00:00 Heather Gray Fabric looks great                 1
## 10      5 2018-07-30 00:00:00 Heather Gray Fabric Love it! I've listen~       1
## # i 3,140 more rows
```

```
#a
num_rows <- nrow(alexa_file)
num_cols <- ncol(alexa_file)
cat("Number of observations:", num_rows, "\n")
```

```
## Number of observations: 3150
```

```r
cat("Number of columns:", num_cols, "\n")
```

Number of columns: 5

```r
#b
library(dplyr)

variations_count <- alexa_file %>%
  group_by(variation) %>%
  summarise(total_count = n())

variations_count
```

```
## # A tibble: 16 x 2
##    variation                total_count
##    <chr>                          <int>
##  1 Black                            261
##  2 Black  Dot                       516
##  3 Black  Plus                      270
##  4 Black  Show                      265
##  5 Black  Spot                      241
##  6 Charcoal Fabric                  430
##  7 Configuration: Fire TV Stick     350
##  8 Heather Gray Fabric              157
##  9 Oak Finish                        14
## 10 Sandstone Fabric                  90
## 11 Walnut Finish                      9
## 12 White                             91
## 13 White  Dot                       184
## 14 White  Plus                       78
## 15 White  Show                       85
## 16 White  Spot                      109
```
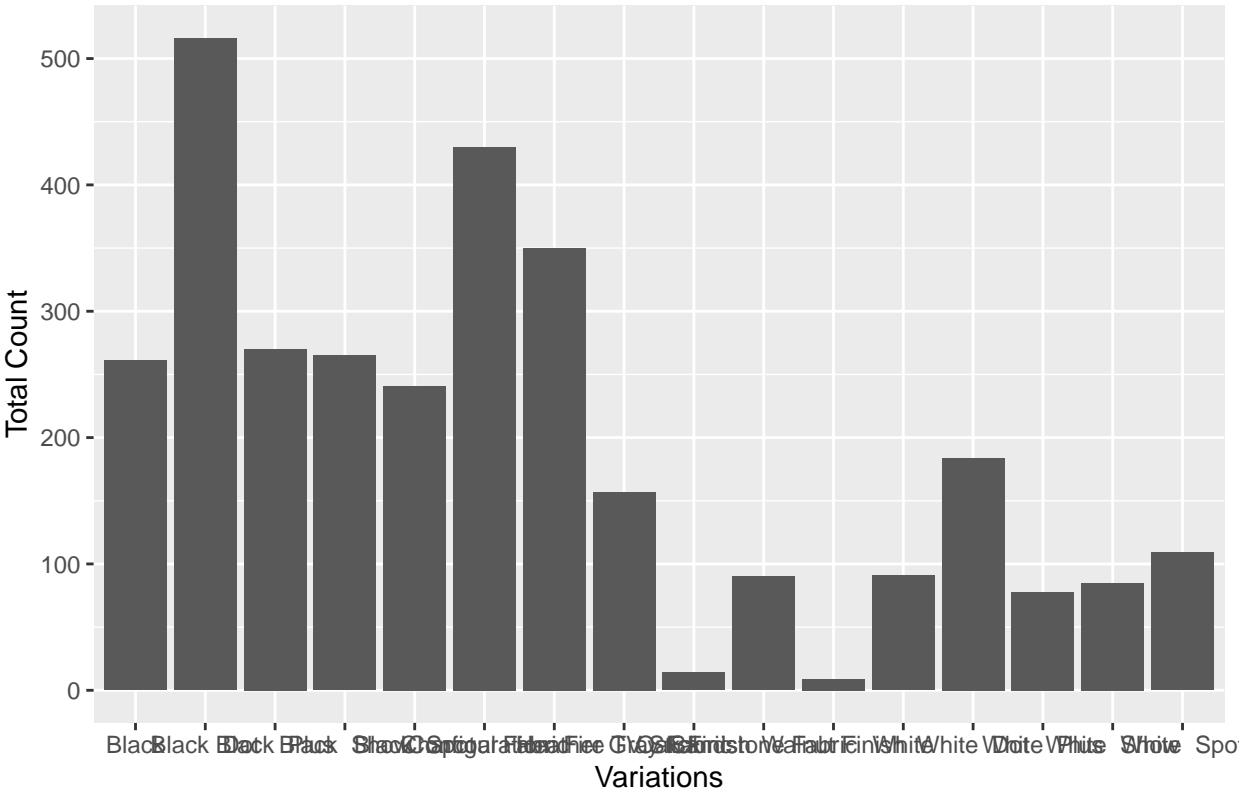
```r
#c
install.packages("ggplot2")
```

Warning: package 'ggplot2' is in use and will not be installed

```r
library(ggplot2)

variation_plot <- ggplot(variations_count, aes(x = variation, y = total_count)) +
  geom_bar(stat = "identity") +
  xlab("Variations") +
  ylab("Total Count") +
  ggtitle("Total Count of Each Variation")

variation_plot
```

Total Count of Each Variation
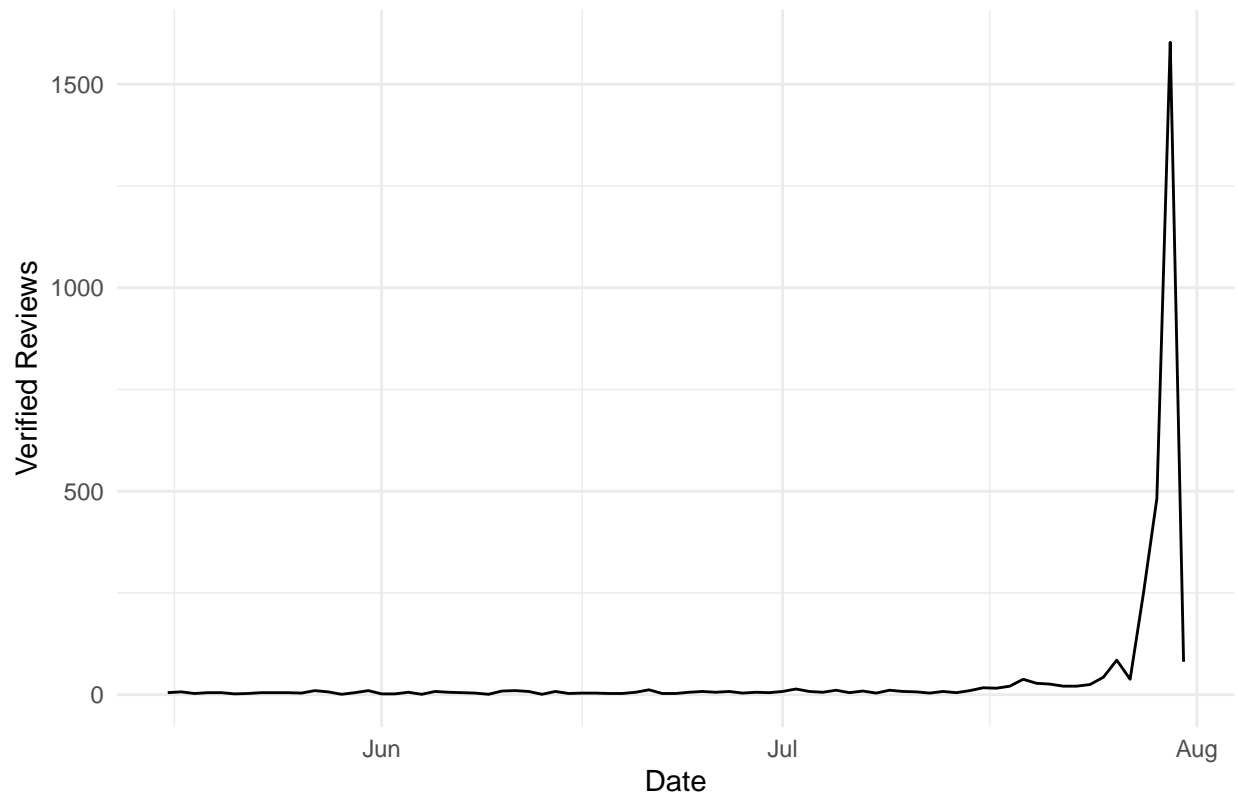


```
#d
library(dplyr)
numofverifiedviews <- alexa_file %>%
  group_by(date) %>%
  summarise(count = n()) %>%
  arrange(date)

verified_reviews_plot <- ggplot(numofverifiedviews, aes(x = date, y = count)) +
  geom_line(color = "black") +
 labs(title = "Verified Reviews Over Time", x = "Date", y = "Verified Reviews") +
  theme_minimal()


verified_reviews_plot
```

Verified Reviews Over Time


```
#e
colnames(alexa_file)
```

```
## [1] "rating"          "date"            "variation"       "verified_reviews"
## [5] "feedback"
```

```
variation_rate <- alexa_file %>%
  group_by(variation) %>%
  summarise(avg_rating = mean(rating, na.rm = TRUE)) %>%
  arrange(desc(avg_rating))
variation_rate
```

```
## # A tibble: 16 x 2
##    variation                  avg_rating
##    <chr>                           <dbl>
##  1 Walnut Finish                    4.89
##  2 Oak Finish                       4.86
##  3 Charcoal Fabric                  4.73
##  4 Heather Gray Fabric              4.69
##  5 Configuration: Fire TV Stick     4.59
##  6 Black  Show                      4.49
##  7 Black  Dot                       4.45
##  8 White  Dot                       4.42
##  9 Black  Plus                      4.37
## 10 White  Plus                      4.36
```

```
## 11 Sandstone Fabric                      4.36
## 12 White   Spot                          4.31
## 13 Black   Spot                          4.31
## 14 White   Show                          4.28
## 15 Black                                 4.23
## 16 White                                 4.14
```

```
ggplot(variation_rate, aes(x = reorder(variation, avg_rating), y = avg_rating, fill = variation)) +
  geom_bar(stat = "identity") + labs(title = "Average Ratings by Variation", x = "Variation", y = "Avera
```