RWorkheet_nandin#4c.Rmd

Mary coolen nandin

2024-11-13

1. Use the dataset mpg A data frame with 234 rows and 11 variables:

a. Show your solutions on how to import a csv file into the environment.

```
mpgData <- read.csv("mpg.csv")
mpgData
```

```
##       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
## 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
## 90   90         ford        f150 pickup 4wd   5.4 2008   8   auto(l4)   4  13
```

```
## 91   91         ford               mustang   3.8 1999   6 manual(m5)   r  18
## 92   92         ford               mustang   3.8 1999   6   auto(l4)   r  18
## 93   93         ford               mustang   4.0 2008   6 manual(m5)   r  17
## 94   94         ford               mustang   4.0 2008   6   auto(l5)   r  16
## 95   95         ford               mustang   4.6 1999   8   auto(l4)   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(l5)   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(l4)   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(l4)   f  24
## 105 105        honda                 civic   1.8 2008   4 manual(m5)   f  26
## 106 106        honda                 civic   1.8 2008   4   auto(l5)   f  25
## 107 107        honda                 civic   1.8 2008   4   auto(l5)   f  24
## 108 108        honda                 civic   2.0 2008   4 manual(m6)   f  21
## 109 109      hyundai               sonata   2.4 1999   4   auto(l4)   f  18
## 110 110      hyundai               sonata   2.4 1999   4 manual(m5)   f  18
## 111 111      hyundai               sonata   2.4 2008   4   auto(l4)   f  21
## 112 112      hyundai               sonata   2.4 2008   4 manual(m5)   f  21
## 113 113      hyundai               sonata   2.5 1999   6   auto(l4)   f  18
## 114 114      hyundai               sonata   2.5 1999   6 manual(m5)   f  18
## 115 115      hyundai               sonata   3.3 2008   6   auto(l5)   f  19
## 116 116      hyundai              tiburon   2.0 1999   4   auto(l4)   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(l4)   f  20
## 120 120      hyundai              tiburon   2.7 2008   6   auto(l4)   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(l5)   4  17
## 124 124         jeep grand cherokee 4wd   3.7 2008   6   auto(l5)   4  15
## 125 125         jeep grand cherokee 4wd   4.0 1999   6   auto(l4)   4  15
## 126 126         jeep grand cherokee 4wd   4.7 1999   8   auto(l4)   4  14
## 127 127         jeep grand cherokee 4wd   4.7 2008   8   auto(l5)   4   9
## 128 128         jeep grand cherokee 4wd   4.7 2008   8   auto(l5)   4  14
## 129 129         jeep grand cherokee 4wd   5.7 2008   8   auto(l5)   4  13
## 130 130         jeep grand cherokee 4wd   6.1 2008   8   auto(l5)   4  11
## 131 131   land rover            range rover   4.0 1999   8   auto(l4)   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(l4)   4  11
## 135 135      lincoln          navigator 2wd   5.4 1999   8   auto(l4)   r  11
## 136 136      lincoln          navigator 2wd   5.4 1999   8   auto(l4)   r  11
## 137 137      lincoln          navigator 2wd   5.4 2008   8   auto(l6)   r  12
## 138 138      mercury        mountaineer 4wd   4.0 1999   6   auto(l5)   4  14
## 139 139      mercury        mountaineer 4wd   4.0 2008   6   auto(l5)   4  13
## 140 140      mercury        mountaineer 4wd   4.6 2008   8   auto(l6)   4  13
## 141 141      mercury        mountaineer 4wd   5.0 1999   8   auto(l4)   4  13
## 142 142       nissan                altima   2.4 1999   4 manual(m5)   f  21
## 143 143       nissan                altima   2.4 1999   4   auto(l4)   f  19
## 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(l4)   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(l4)   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(l5)   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(l4)   f  18
## 156 156      pontiac             grand prix   3.8 1999   6   auto(l4)   f  16
## 157 157      pontiac             grand prix   3.8 1999   6   auto(l4)   f  17
## 158 158      pontiac             grand prix   3.8 2008   6   auto(l4)   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(l4)   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(l4)   4  20
## 165 165       subaru           forester awd   2.5 2008   4   auto(l4)   4  18
## 166 166       subaru            impreza awd   2.2 1999   4   auto(l4)   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(l4)   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(l4)   4  16
## 176 176       toyota            4runner 4wd   3.4 1999   6   auto(l4)   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(l5)   4  16
## 179 179       toyota            4runner 4wd   4.7 2008   8   auto(l5)   4  14
## 180 180       toyota                  camry   2.2 1999   4 manual(m5)   f  21
## 181 181       toyota                  camry   2.2 1999   4   auto(l4)   f  21
## 182 182       toyota                  camry   2.4 2008   4 manual(m5)   f  21
## 183 183       toyota                  camry   2.4 2008   4   auto(l5)   f  21
## 184 184       toyota                  camry   3.0 1999   6   auto(l4)   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(l4)   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(l4)   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(l3)   f  24
## 195 195       toyota                corolla   1.8 1999   4   auto(l4)   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
## 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
## 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
## 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
```

b. Which variables from mpg dataset are categorical? Manufacturer, drv, cyl, model, trans, fl, class
c. Which are continuous variables? dsipl, year, cyt, hwy

2. Which manufacturer has the most models in this data set? Which model has the most variations? Show your answer.

```
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
```

```
manufacturersCount <- mpgData %>%
group_by(manufacturer) %>%
summarise(modelCount = n_distinct(model), .groups = 'drop') %>%
arrange(desc(modelCount))
mostModelsManufacturer <- manufacturersCount %>% slice(1)
mostVariationCount <- mpgData %>%
group_by(model) %>%
summarise(variationCount = n(), .groups = 'drop') %>%
arrange(desc(variationCount))
mostVariationModel <- mostVariationCount %>% slice(1)
mostModelsManufacturer
```

```
## # A tibble: 1 x 2
##   manufacturer modelCount
##   <chr>             <int>
## 1 toyota                6
```

```
mostVariationModel
```

```
## # A tibble: 1 x 2
##   model       variationCount
##   <chr>                <int>
## 1 caravan 2wd             11
```

a. Group the manufacturers and find the unique models. Show your codes and result.

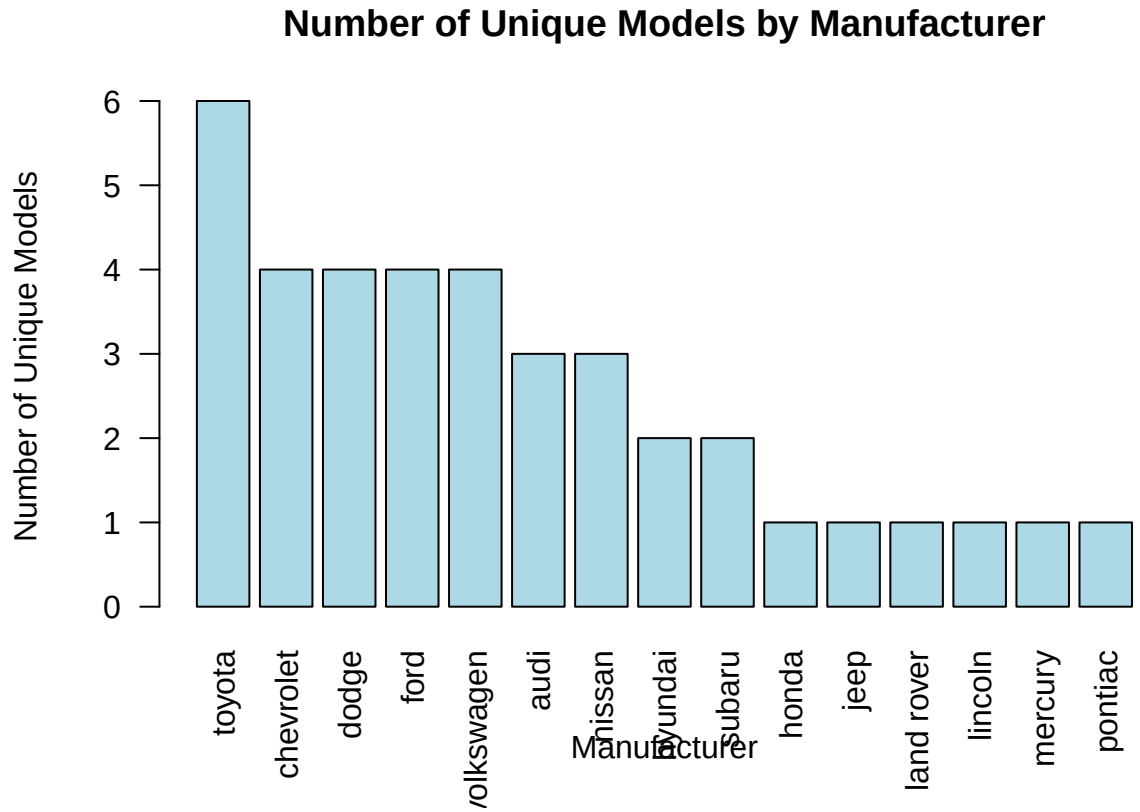
```
uniqueModels <- mpgData %>%
group_by(manufacturer) %>%
summarise(uniqueModels = list(unique(model))) %>%
arrange(manufacturer)
uniqueModels
```

```
## # A tibble: 15 x 2
##    manufacturer uniqueModels
##    <chr>        <list>
##  1 audi         <chr [3]>
##  2 chevrolet    <chr [4]>
##  3 dodge        <chr [4]>
##  4 ford         <chr [4]>
```

```
##  5 honda        <chr [1]>
##  6 hyundai      <chr [2]>
##  7 jeep         <chr [1]>
##  8 land rover   <chr [1]>
##  9 lincoln      <chr [1]>
## 10 mercury      <chr [1]>
## 11 nissan       <chr [3]>
## 12 pontiac      <chr [1]>
## 13 subaru       <chr [2]>
## 14 toyota       <chr [6]>
## 15 volkswagen   <chr [4]>
```

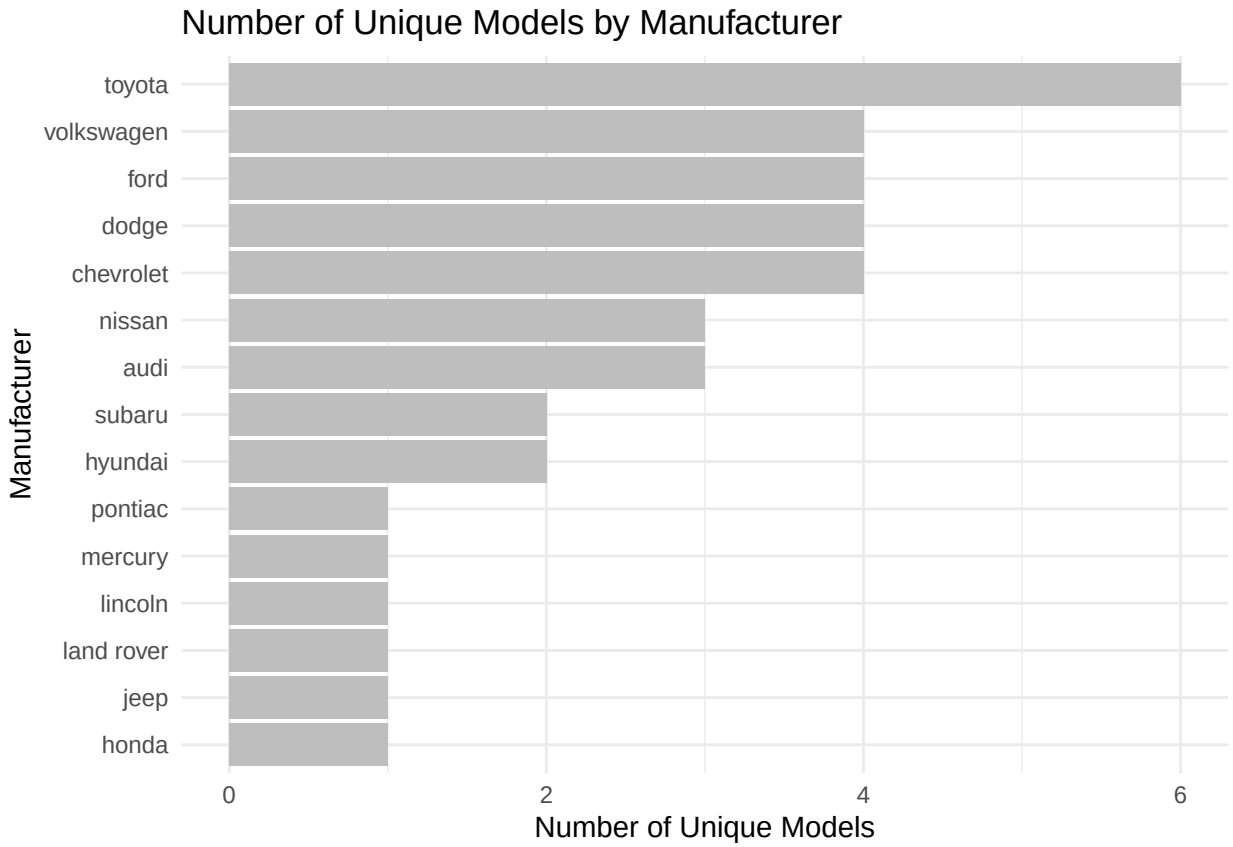
b. Graph the result by using plot() and ggplot(). Write the codes and its result.

```
modelCounts <- mpgData %>%
group_by(manufacturer) %>%
summarise(uniqueModelCount = n_distinct(model)) %>%
arrange(desc(uniqueModelCount))
barplot(modelCounts$uniqueModelCount,
names.arg = modelCounts$manufacturer,
las = 2,
col = "lightblue",
main = "Number of Unique Models by Manufacturer",
xlab = "Manufacturer",
ylab = "Number of Unique Models")
```




```
library(ggplot2)
ggplot(modelCounts, aes(x = reorder(manufacturer, uniqueModelCount), y = uniqueModelCount)) +
geom_bar(stat = "identity", fill = "grey") +
```

```
coord_flip() + labs(title = "Number of Unique Models by Manufacturer",
x = "Manufacturer",
y = "Number of Unique Models") +
theme_minimal()
```



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?

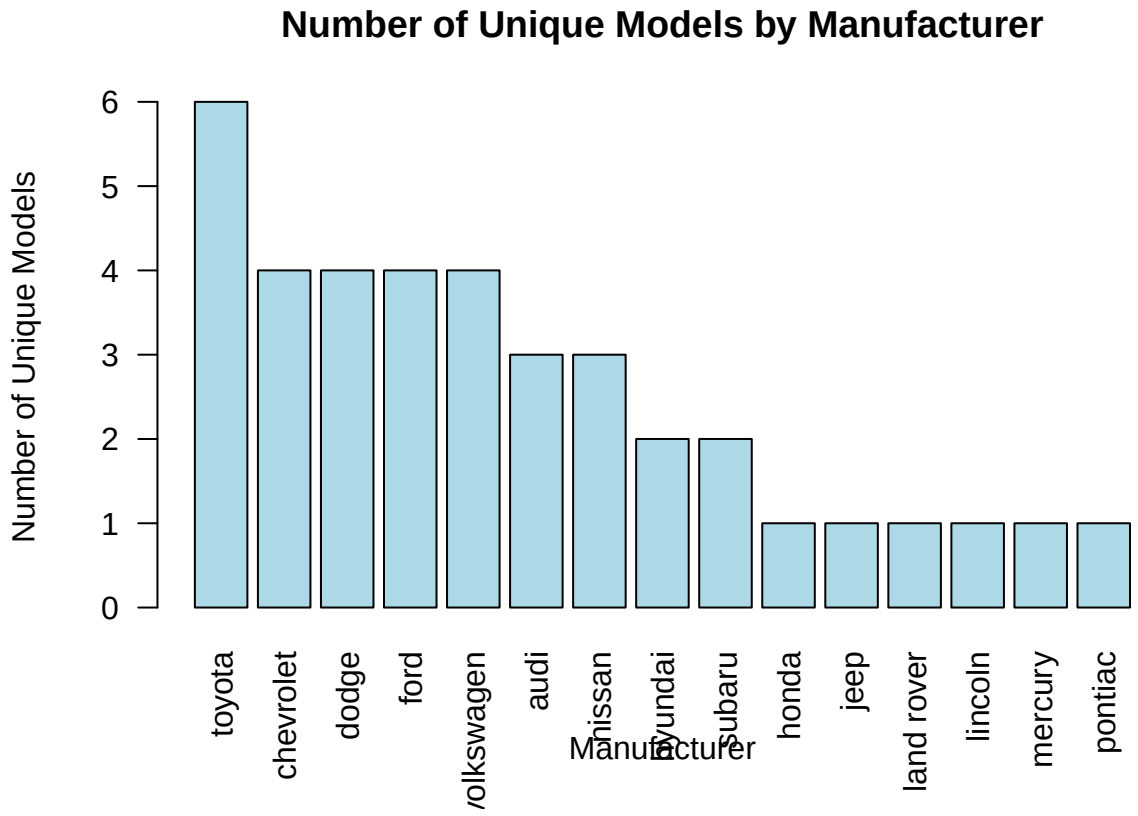
```
UniqueModels <- mpgData %>%
group_by(manufacturer) %>%
summarise(uniqueModels = list(unique(model))) %>%
arrange(manufacturer)
uniqueModels
```

```
## # A tibble: 15 x 2
##    manufacturer uniqueModels
##    <chr>        <list>
##  1 audi         <chr [3]>
##  2 chevrolet    <chr [4]>
##  3 dodge        <chr [4]>
##  4 ford         <chr [4]>
##  5 honda        <chr [1]>
##  6 hyundai      <chr [2]>
##  7 jeep         <chr [1]>
##  8 land rover   <chr [1]>
##  9 lincoln      <chr [1]>
## 10 mercury      <chr [1]>
## 11 nissan       <chr [3]>
```

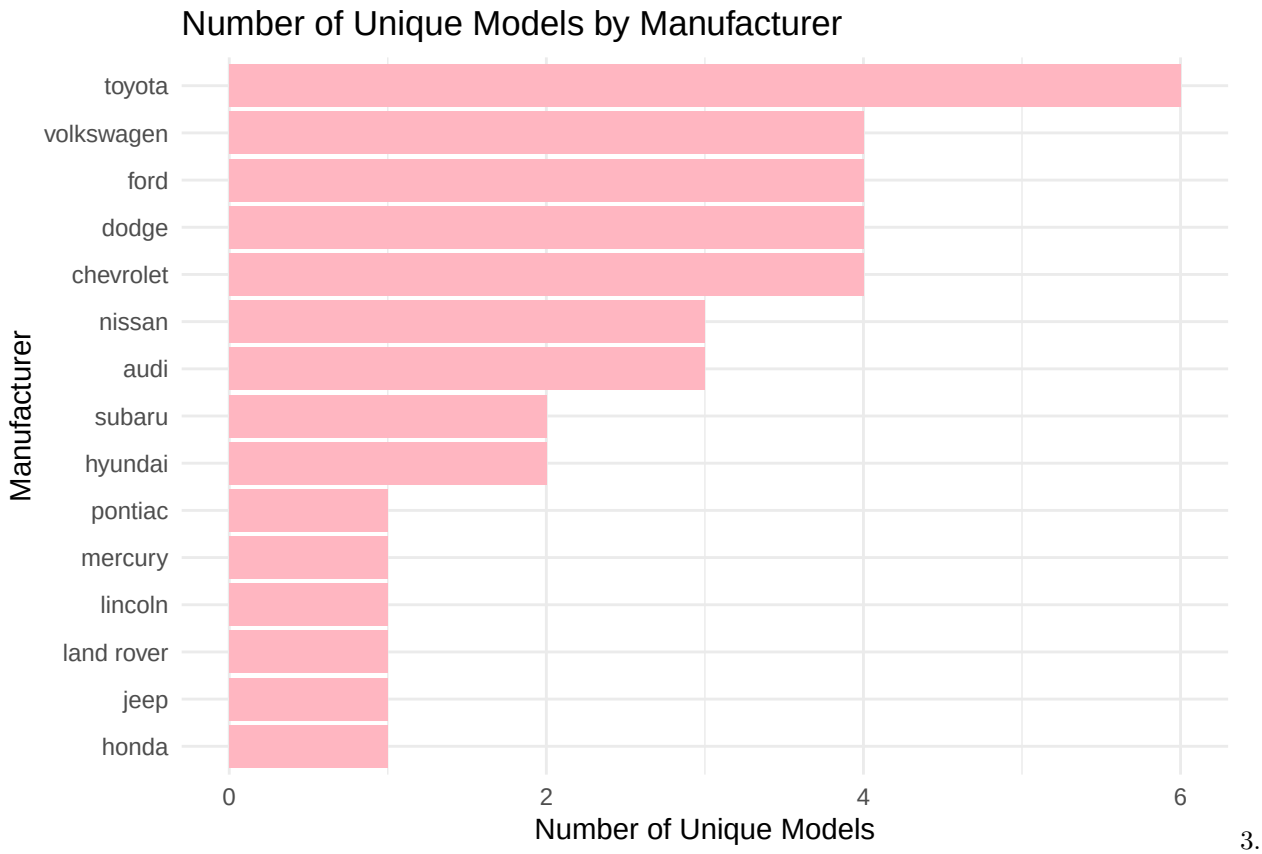
```
## 12 pontiac      <chr [1]>
## 13 subaru       <chr [2]>
## 14 toyota       <chr [6]>
## 15 volkswagen   <chr [4]>
```

b. For you, is it useful? If not, how could you modify the data to make it more informative?

```
modelCounts <- mpgData %>%
group_by(manufacturer) %>%
summarise(uniqueModelCount = n_distinct(model)) %>%
arrange(desc(uniqueModelCount))
barplot(modelCounts$uniqueModelCount,
names.arg = modelCounts$manufacturer,
las = 2,
col = "lightblue",
main = "Number of Unique Models by Manufacturer",
xlab = "Manufacturer",
ylab = "Number of Unique Models")
```

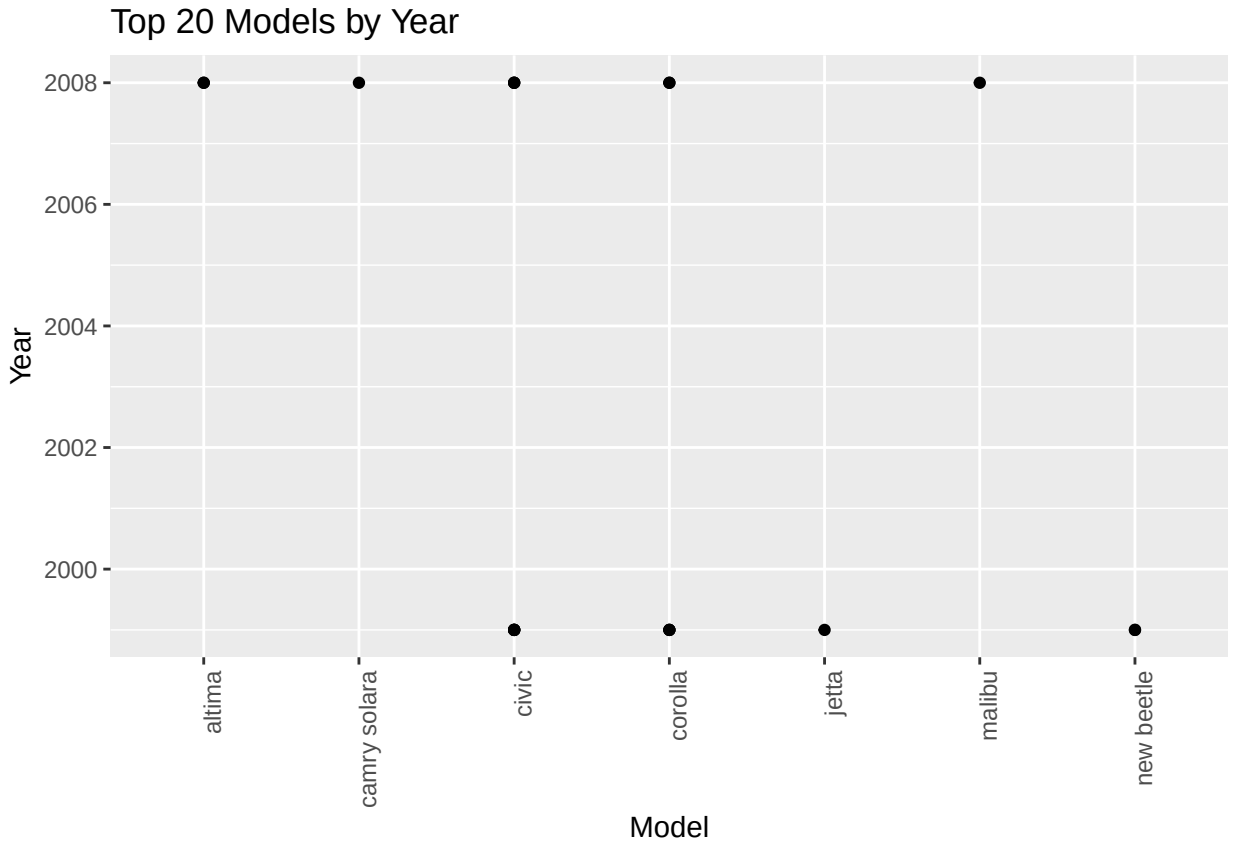



```
library(ggplot2)
ggplot(modelCounts, aes(x = reorder(manufacturer, uniqueModelCount), y = uniqueModelCount)) +
geom_bar(stat = "identity", fill = "lightpink") +
coord_flip() +
labs(title = "Number of Unique Models by Manufacturer",
x = "Manufacturer",
y = "Number of Unique Models") +
theme_minimal()
```



3. Plot the model and the year using ggplot(). Use only the top 20 observations. Write the codes and its results.

```
library(ggplot2)
library(dplyr)
top_20_mpg <- mpgData %>%
arrange(desc(cty)) %>%
head(20)
ggplot(top_20_mpg, aes(x = model, y = year)) +
geom_point() +
labs(title = "Top 20 Models by Year", x = "Model", y = "Year") +
  theme(axis.text.x = element_text(angle = 90, hjust = 1))
```



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

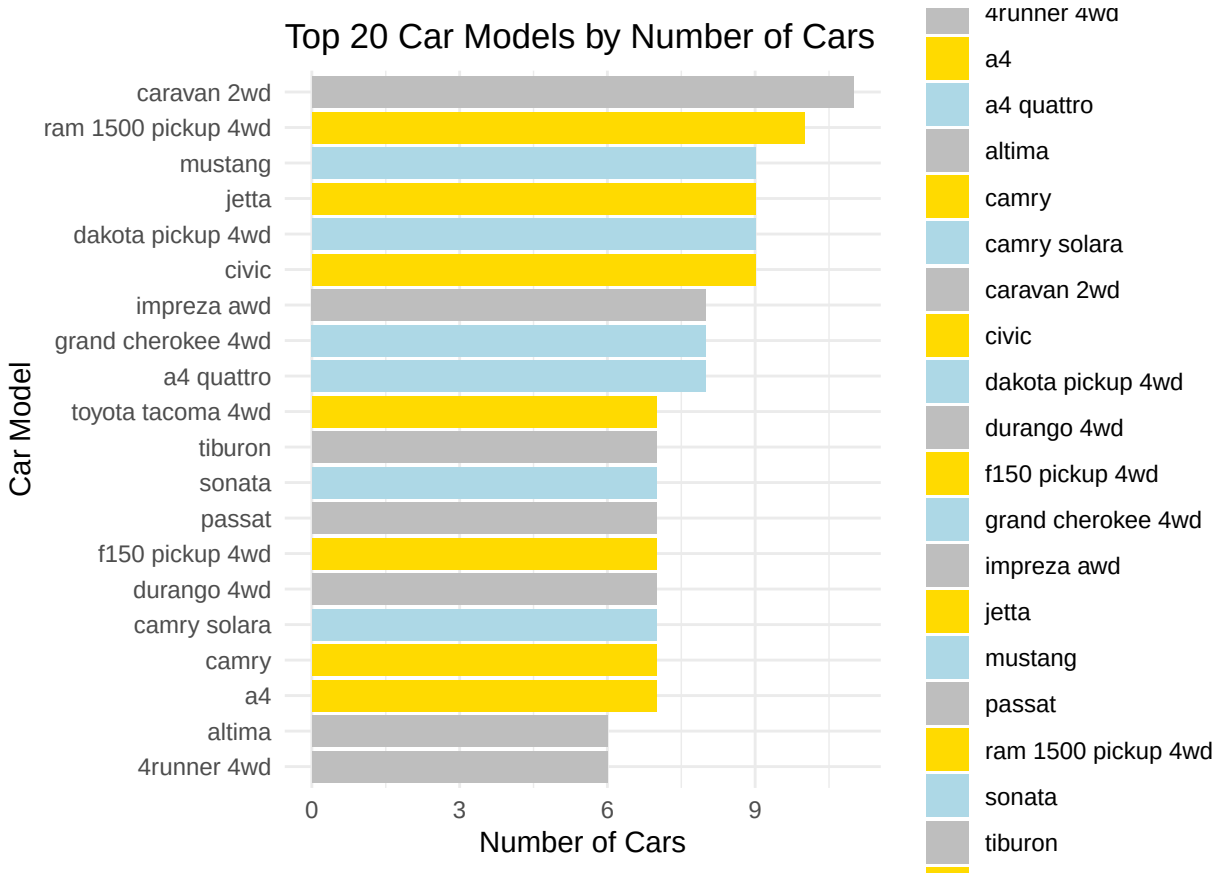
```
modelCounts <- mpg %>%
group_by(model) %>%
summarise(numberOfCars = n()) %>%
arrange(desc(numberOfCars))
print(modelCounts)
```

```
## # A tibble: 38 x 2
##    model               numberOfCars
##    <chr>                      <int>
##  1 caravan 2wd                   11
##  2 ram 1500 pickup 4wd           10
##  3 civic                          9
##  4 dakota pickup 4wd              9
##  5 jetta                          9
##  6 mustang                        9
##  7 a4 quattro                     8
##  8 grand cherokee 4wd             8
##  9 impreza awd                    8
## 10 a4                             7
## # i 28 more rows
```

a. Plot using geom_bar() using the top 20 observations only. The graphs shoudl have a title, labels and colors. Show code and results.

```
topModels <- mpgData %>%
group_by(model) %>%
summarise(numberOfCars = n()) %>%
```

```
arrange(desc(numberOfCars)) %>%
slice_head(n = 20)
ggplot(topModels, aes(x = reorder(model, numberOfCars), y = numberOfCars, fill = model)) +
geom_bar(stat = "identity") +
coord_flip() +
labs(title = "Top 20 Car Models by Number of Cars",
x = "Car Model",
y = "Number of Cars",
fill = "Model") +
theme_minimal() +
scale_fill_manual(values = c("grey", "#ffda00", "lightblue", "grey", "#ffda00",
"lightblue", "grey", "#ffda00", "lightblue", "grey",
"#ffda00", "lightblue", "grey", "#ffda00", "lightblue",
"grey", "#ffda00", "lightblue", "grey", "#ffda00"))
```



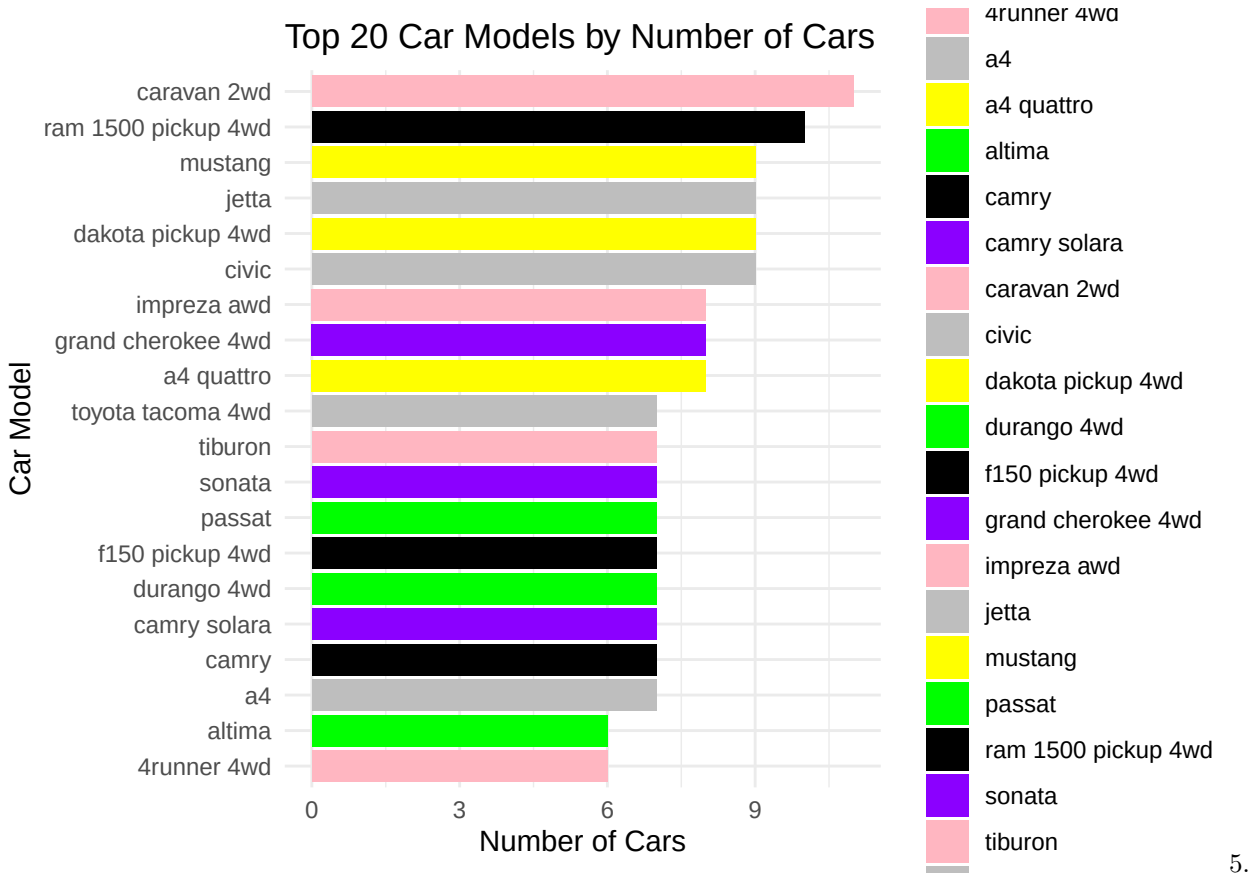
b. Plot using the geom_bar() + coord_flip() just like what is shown below. Show codes and its result.

```
library(viridis)
```

```
## Loading required package: viridisLite
```

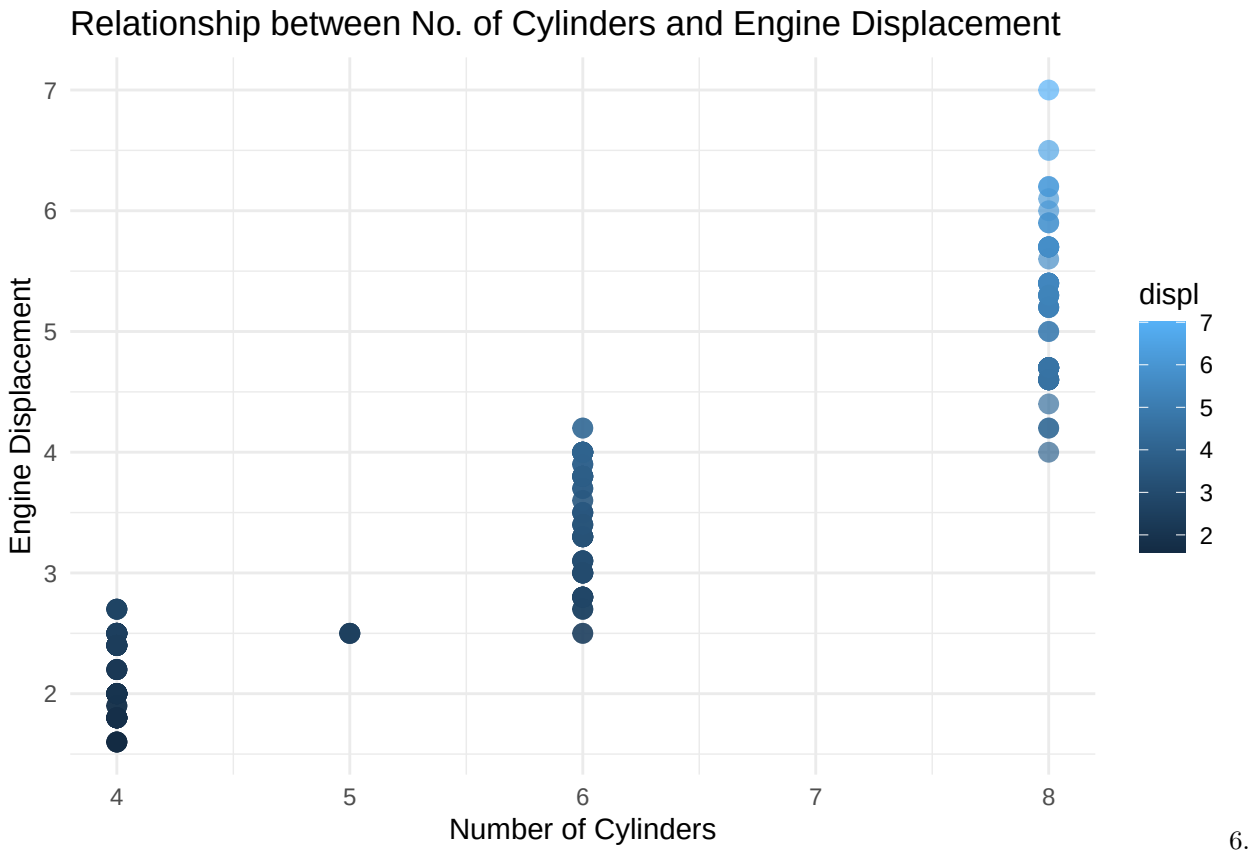
```
library(viridisLite)
topModels <- mpgData %>%
  group_by(model) %>%
summarise(numberOfCars = n()) %>%
arrange(desc(numberOfCars)) %>%
slice_head(n = 20)
ggplot(topModels, aes(x = reorder(model, numberOfCars), y = numberOfCars, fill = model)) +
```

```
geom_bar(stat = "identity") +
coord_flip() +
labs(title = "Top 20 Car Models by Number of Cars",
x = "Car Model",
y = "Number of Cars") +
theme_minimal() +
scale_fill_manual(values = c("lightpink", "grey", "#ffff00", "#00ff00", "#000",
"#8b00ff", "lightpink", "grey", "#ffff00", "#00ff00",
"#000", "#8b00ff","lightpink", "grey", "#ffff00",
"#00ff00", "#000", "#8b00ff","lightpink", "grey"))
```



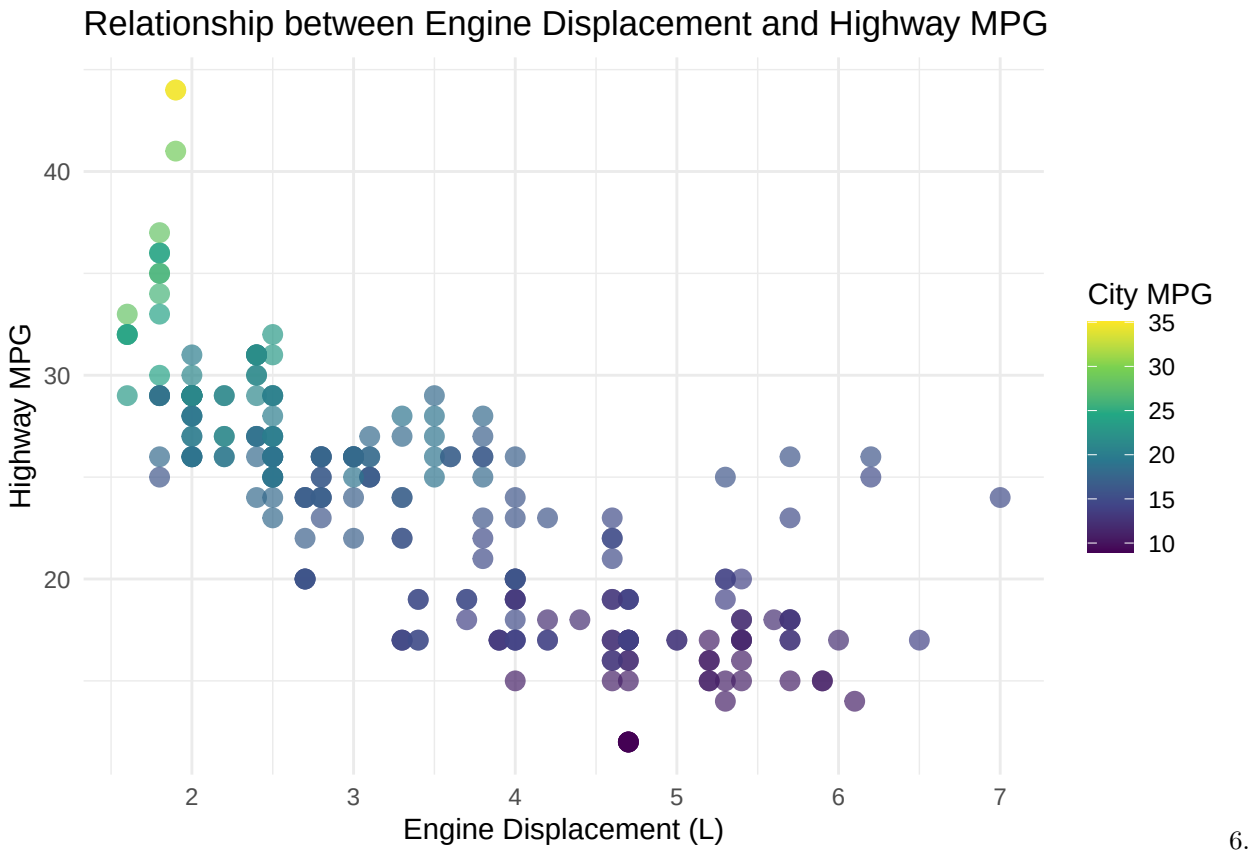
5. Plot the relationship between cyl - number of cylinders and displ - engine displacement usinggeom_point with aesthetic color = engine displacement. Title should be "Relationship between No. of Cylinders and Engine Displacement". a. How would you describe its relationship? Show the codes and its result.

```
ggplot(mpgData, aes(x = cyl, y = displ, color = displ)) +
geom_point(size = 3, alpha = 0.7) +
labs(title = "Relationship between No. of Cylinders and Engine Displacement",
x = "Number of Cylinders",
y = "Engine Displacement") +
theme_minimal() +
  scale_fill_viridis_c()
```



6. Plot the relationship between displ (engine displacement) and hwy(highway miles per gallon). Mapped it with a continuous variable you have identified in #1-c. What is its result? Why it produced such output?

```
ggplot(mpg, aes(x = displ, y = hwy, color = cty)) +
geom_point(size = 3, alpha = 0.7) +
labs(title = "Relationship between Engine Displacement and Highway MPG",
x = "Engine Displacement (L)",
y = "Highway MPG",
color = "City MPG") +
theme_minimal() +
scale_color_viridis_c()
```



6. Import the traffic.csv onto your R environment.

```
library(readr)
trafficData <- read_csv("/cloud/project/traffic.csv")
```

```
## Rows: 48120 Columns: 4
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## dbl  (3): Junction, Vehicles, ID
## dttm (1): DateTime
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
head(trafficData)
```

```
## # A tibble: 6 x 4
##   DateTime            Junction Vehicles          ID
##   <dttm>                 <dbl>    <dbl>       <dbl>
## 1 2015-11-01 00:00:00        1       15 20151101001
## 2 2015-11-01 01:00:00        1       13 20151101011
## 3 2015-11-01 02:00:00        1       10 20151101021
## 4 2015-11-01 03:00:00        1        7 20151101031
## 5 2015-11-01 04:00:00        1        9 20151101041
## 6 2015-11-01 05:00:00        1        6 20151101051
```

a. How many numbers of observation does it have? What are the variables of the traffic dataset the Show your answer.

```
numberOfObservations <- nrow(trafficData)
variables <- colnames(trafficData)
numberOfObservations
```

```
## [1] 48120
```

```
variables
```

```
## [1] "DateTime" "Junction" "Vehicles" "ID"
```

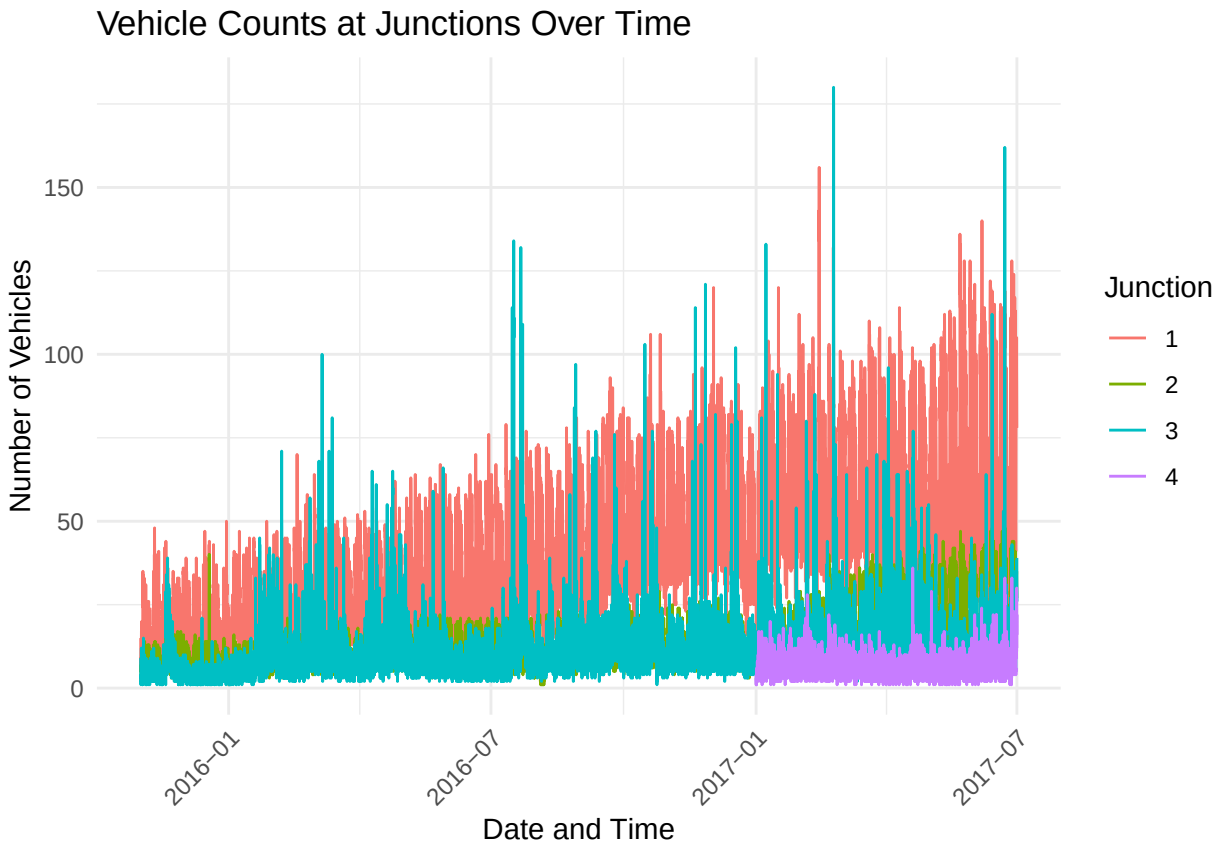
b. subset the traffic dataset into junctions. What is the R codes and its output?

```
library(dplyr)
junctions <- subset(trafficData, Junction == TRUE)
head(junctions)
```

```
## # A tibble: 6 x 4
##   DateTime            Junction Vehicles          ID
##   <dttm>                 <dbl>    <dbl>       <dbl>
## 1 2015-11-01 00:00:00        1       15 20151101001
## 2 2015-11-01 01:00:00        1       13 20151101011
## 3 2015-11-01 02:00:00        1       10 20151101021
## 4 2015-11-01 03:00:00        1        7 20151101031
## 5 2015-11-01 04:00:00        1        9 20151101041
## 6 2015-11-01 05:00:00        1        6 20151101051
```

c. Plot each junction in a using geom_line(). Show your solution and output

```
library(ggplot2)
ggplot(trafficData, aes(x = DateTime, y = Vehicles, color = factor(Junction))) +
geom_line() +
labs(title = "Vehicle Counts at Junctions Over Time",
x = "Date and Time",
y = "Number of Vehicles",
color = "Junction") +
theme_minimal() +
theme(axis.text.x = element_text(angle = 45, hjust = 1))
```



7. From alexa_file.xlsx, import it to your environment a. How many observations does alexa_file has? What about the number of columns? Show your solution and answer.

```
library(readxl)
alexaFile <- read_excel("/cloud/project/alexa_file.xlsx")
dimensions <- dim(alexaFile)
rows <- dimensions[1]
columns <- dimensions[2]
rows
```

```
## [1] 3150
```

```
columns
```

```
## [1] 5
```

b. group the variations and get the total of each variations. Use dplyr package. Show solution and answer.

```
library(dplyr)
totalVariation <- alexaFile %>%
group_by(variation) %>%
summarise(total = n())
totalVariation
```

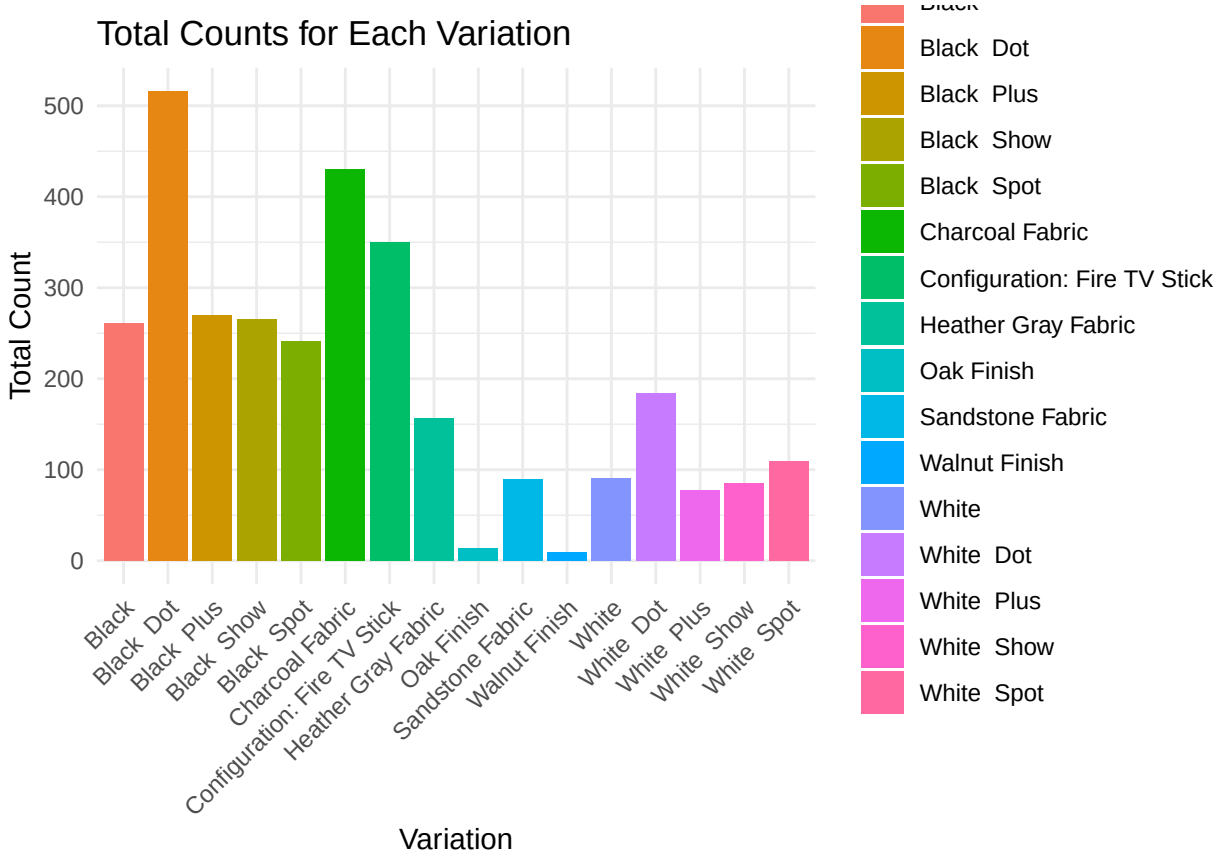
```
## # A tibble: 16 x 2
##    variation                    total
##    <chr>                        <int>
##  1 Black                          261
##  2 Black  Dot                     516
##  3 Black  Plus                    270
##  4 Black  Show                    265
```

```
##  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
```

```
## # A tibble: 16 x 2
```

c. Plot the variations using the ggplot() function. What did you observe? Complete the details of the graph. Show solution and answer.

```
library(ggplot2)
ggplot(totalVariation, aes(x = variation, y = total, fill = variation)) +
geom_bar(stat = "identity") +
labs(title = "Total Counts for Each Variation", x = "Variation", y = "Total Count") +
theme_minimal() +
theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

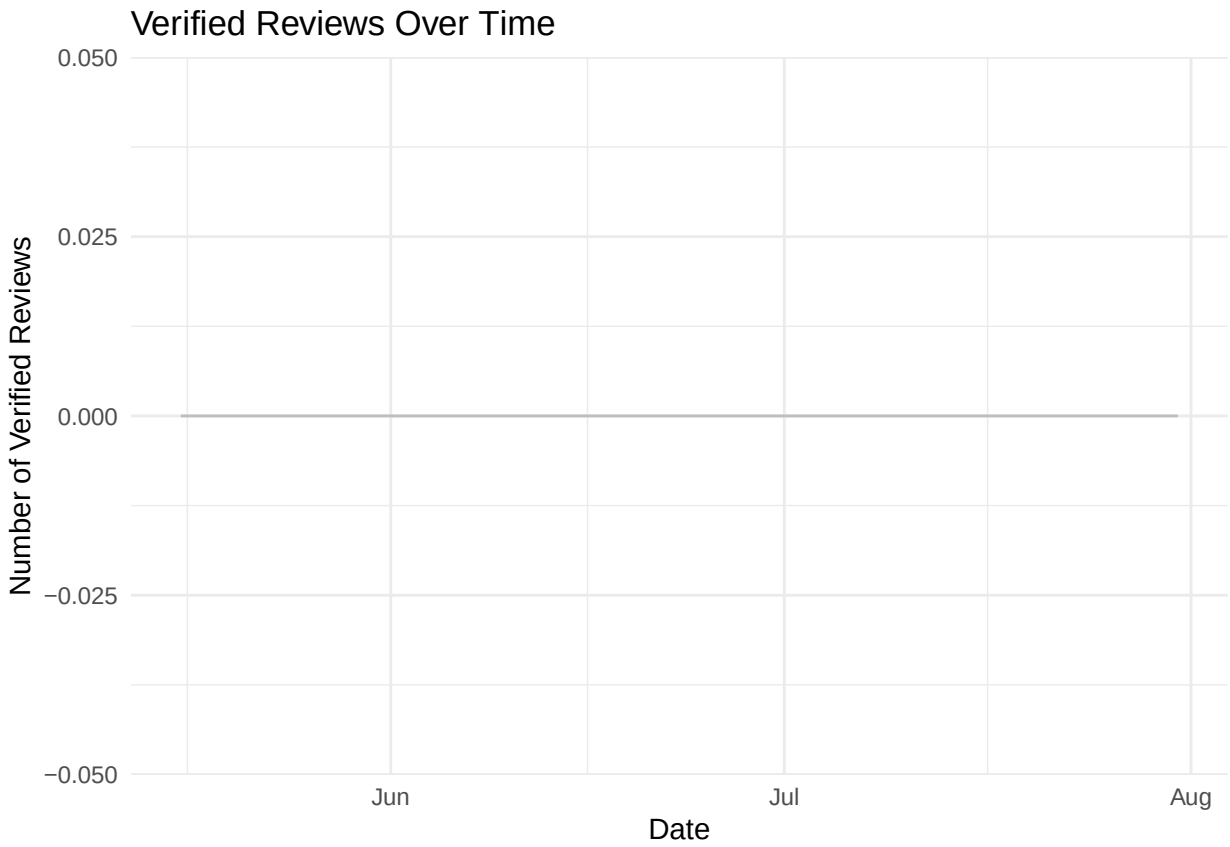


d. Plot a geom_line() with the date and the number of verified reviews. Complete the details of the graphs. Show your answer and solution.

```r
alexaFile$verified_reviews <- as.numeric(alexaFile$verified_reviews)
```

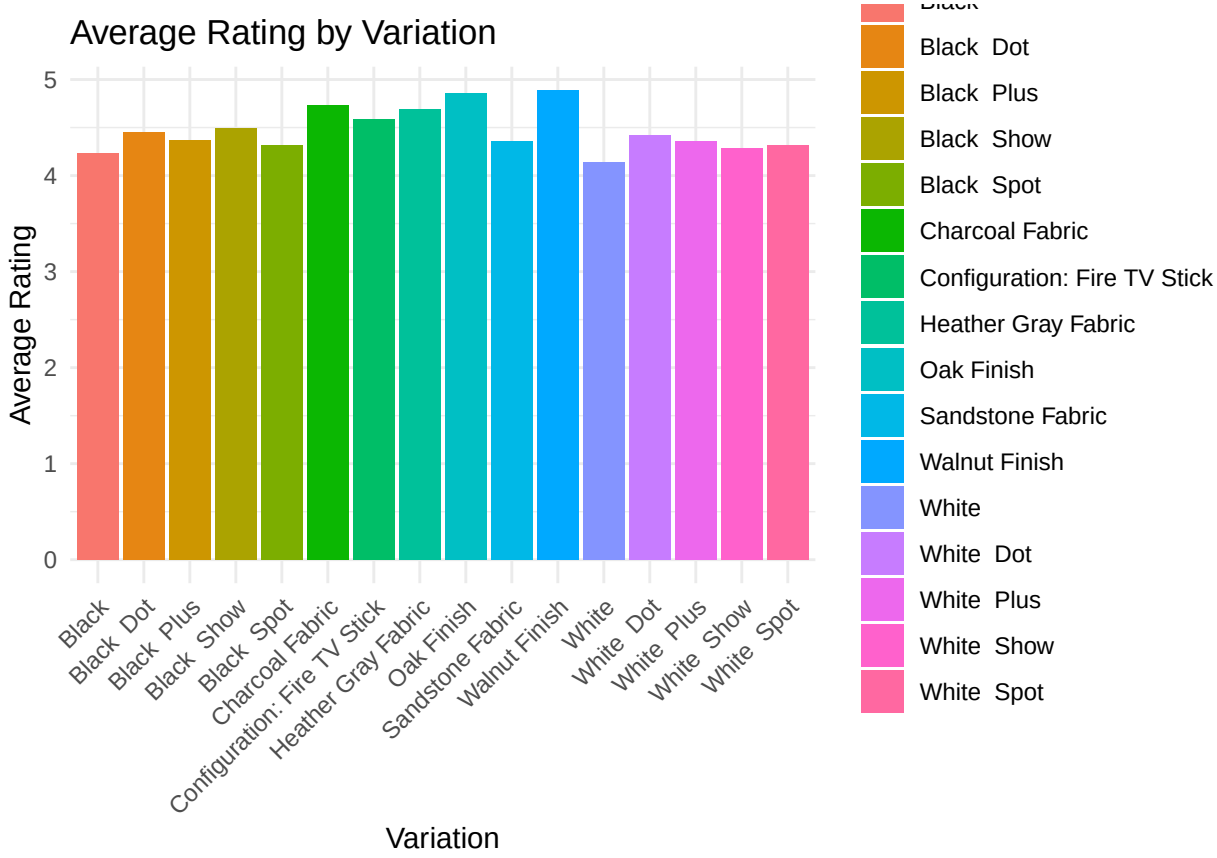
```
## Warning: NAs introduced by coercion
```

```r
## Warning: NAs introduced by coercion
reviewsByDate <- alexaFile %>%
group_by(date) %>%
summarise(totalVerifiedReviews = sum(verified_reviews, na.rm = TRUE))
library(ggplot2)
ggplot(reviewsByDate, aes(x = date, y = totalVerifiedReviews)) +
geom_line(color = "grey") +
labs(title = "Verified Reviews Over Time", x = "Date", y = "Number of Verified Reviews") +
theme_minimal()
```



e. Get the relationship of variations and ratings. Which variations got the most highest in rating? Plot a graph to show its relationship. Show your solution and answer.

```r
library(ggplot2)
library(dplyr)
variationRatings <- alexaFile %>%
group_by(variation) %>%
summarise(ratingAverage = mean(rating, na.rm = TRUE))
ggplot(variationRatings, aes(x = variation, y = ratingAverage, fill = variation)) +
geom_bar(stat = "identity") +
labs(title = "Average Rating by Variation", x = "Variation", y = "Average Rating") +
theme_minimal() +
theme(axis.text.x = element_text(angle = 45, hjust = 1))
```


Average Rating by Variation
Average Rating
0
1
2
3
4
5
Black
Black Dot
Black Plus
Black Show
Black Spot
Charcoal Fabric
Configuration: Fire TV Stick
Heather Gray Fabric
Oak Finish
Sandstone Fabric
Walnut Finish
White
White Dot
White Plus
White Show
White Spot
Variation