

RWorksheet_Ganon#4c.Rmd

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2024-11-07

#1.

```
library(readxl)
mpg <- read.csv("mpg.csv")
mpg
```

| ## | 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 |

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|-------|----|-----------|---------------------|-----|------|---|------------|---|----|
| ## 37 | 37 | chevrolet | malibu | 3.6 | 2008 | 6 | auto(s6) | f | 17 |
| ## 38 | 38 | dodge | caravan 2wd | 2.4 | 1999 | 4 | auto(13) | f | 18 |
| ## 39 | 39 | dodge | caravan 2wd | 3.0 | 1999 | 6 | auto(14) | f | 17 |
| ## 40 | 40 | dodge | caravan 2wd | 3.3 | 1999 | 6 | auto(14) | f | 16 |
| ## 41 | 41 | dodge | caravan 2wd | 3.3 | 1999 | 6 | auto(14) | f | 16 |
| ## 42 | 42 | dodge | caravan 2wd | 3.3 | 2008 | 6 | auto(14) | f | 17 |
| ## 43 | 43 | dodge | caravan 2wd | 3.3 | 2008 | 6 | auto(14) | f | 17 |
| ## 44 | 44 | dodge | caravan 2wd | 3.3 | 2008 | 6 | auto(14) | f | 11 |
| ## 45 | 45 | dodge | caravan 2wd | 3.8 | 1999 | 6 | auto(14) | f | 15 |
| ## 46 | 46 | dodge | caravan 2wd | 3.8 | 1999 | 6 | auto(14) | f | 15 |
| ## 47 | 47 | dodge | caravan 2wd | 3.8 | 2008 | 6 | auto(16) | f | 16 |
| ## 48 | 48 | dodge | caravan 2wd | 4.0 | 2008 | 6 | auto(16) | 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(14) | 4 | 14 |
| ## 51 | 51 | dodge | dakota pickup 4wd | 3.9 | 1999 | 6 | auto(14) | 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(15) | 4 | 14 |
| ## 54 | 54 | dodge | dakota pickup 4wd | 4.7 | 2008 | 8 | auto(15) | 4 | 14 |
| ## 55 | 55 | dodge | dakota pickup 4wd | 4.7 | 2008 | 8 | auto(15) | 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(14) | 4 | 11 |
| ## 58 | 58 | dodge | durango 4wd | 3.9 | 1999 | 6 | auto(14) | 4 | 13 |
| ## 59 | 59 | dodge | durango 4wd | 4.7 | 2008 | 8 | auto(15) | 4 | 13 |
| ## 60 | 60 | dodge | durango 4wd | 4.7 | 2008 | 8 | auto(15) | 4 | 9 |
| ## 61 | 61 | dodge | durango 4wd | 4.7 | 2008 | 8 | auto(15) | 4 | 13 |
| ## 62 | 62 | dodge | durango 4wd | 5.2 | 1999 | 8 | auto(14) | 4 | 11 |
| ## 63 | 63 | dodge | durango 4wd | 5.7 | 2008 | 8 | auto(15) | 4 | 13 |
| ## 64 | 64 | dodge | durango 4wd | 5.9 | 1999 | 8 | auto(14) | 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(15) | 4 | 9 |
| ## 67 | 67 | dodge | ram 1500 pickup 4wd | 4.7 | 2008 | 8 | auto(15) | 4 | 13 |
| ## 68 | 68 | dodge | ram 1500 pickup 4wd | 4.7 | 2008 | 8 | auto(15) | 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(14) | 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(15) | 4 | 13 |
| ## 74 | 74 | dodge | ram 1500 pickup 4wd | 5.9 | 1999 | 8 | auto(14) | 4 | 11 |
| ## 75 | 75 | ford | expedition 2wd | 4.6 | 1999 | 8 | auto(14) | r | 11 |
| ## 76 | 76 | ford | expedition 2wd | 5.4 | 1999 | 8 | auto(14) | r | 11 |
| ## 77 | 77 | ford | expedition 2wd | 5.4 | 2008 | 8 | auto(16) | r | 12 |
| ## 78 | 78 | ford | explorer 4wd | 4.0 | 1999 | 6 | auto(15) | 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(15) | 4 | 14 |
| ## 81 | 81 | ford | explorer 4wd | 4.0 | 2008 | 6 | auto(15) | 4 | 13 |
| ## 82 | 82 | ford | explorer 4wd | 4.6 | 2008 | 8 | auto(16) | 4 | 13 |
| ## 83 | 83 | ford | explorer 4wd | 5.0 | 1999 | 8 | auto(14) | 4 | 13 |
| ## 84 | 84 | ford | f150 pickup 4wd | 4.2 | 1999 | 6 | auto(14) | 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(14) | 4 | 13 |
| ## 88 | 88 | ford | f150 pickup 4wd | 4.6 | 2008 | 8 | auto(14) | 4 | 13 |
| ## 89 | 89 | ford | f150 pickup 4wd | 5.4 | 1999 | 8 | auto(14) | 4 | 11 |
| ## 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 |
| ## 144 | 144 | nissan | altima | 2.5 | 2008 | 4 auto(av) | f | 23 |

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|------------|---------|----------------|----------|--------------|---|----|
| ## 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 |

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|----|-----|-----|------------|------------------------|-----|------|---|------------|---|----|
| ## | 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 | | | | | | |
| ## | 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
```

```
#a. first you need to upload and read the csv file using read.csv
```

```
#b. the variables that are categorical are manufacturer, trans, model, trans, drv, fl, and class.
```

```
#c. the continuous variables are disp, cty, and hwy
```

```
#2.
```

```
manufacture_car <- table(mpg$manufacturer)
manufacture_car
```

```
##
##      audi  chevrolet      dodge      ford      honda  hyundai      jeep
##      18      19      37      25      9      14      8
## land rover    lincoln  mercury    nissan  pontiac    subaru    toyota
##      4      3      4      13      5      14      34
## volkswagen
##      27
```

the most models are dodge which is 37.

```
model_car <- table(mpg$model)
model_car
```

```
##
##      4runner 4wd      a4      a4 quattro
##      6      7      8
##      a6 quattro      altima  c1500 suburban 2wd
##      3      6      5
##      camry      camry solara      caravan 2wd
##      7      7      11
##      civic      corolla      corvette
##      9      5      5
##      dakota pickup 4wd      durango 4wd      expedition 2wd
##      9      7      3
##      explorer 4wd      f150 pickup 4wd      forester awd
##      6      7      6
##      grand cherokee 4wd      grand prix      gti
##      8      5      5
##      impreza awd      jetta      k1500 tahoe 4wd
##      8      9      4
## land cruiser wagon 4wd      malibu      maxima
##      2      5      3
##      mountaineer 4wd      mustang      navigator 2wd
##      4      9      3
##      new beetle      passat      pathfinder 4wd
##      6      7      4
##      ram 1500 pickup 4wd      range rover      sonata
##      10      4      7
##      tiburon      toyota tacoma 4wd
##      7      7
```

```
# The caravan 2wd with 11 variations has the most.
```

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

```
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

unique_mod <- mpg %>%
  group_by(manufacturer) %>%
  summarise(models = n_distinct(model))
unique_mod
```

```
## # A tibble: 15 x 2
##   manufacturer models
##   <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
```

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

```
library(ggplot2)

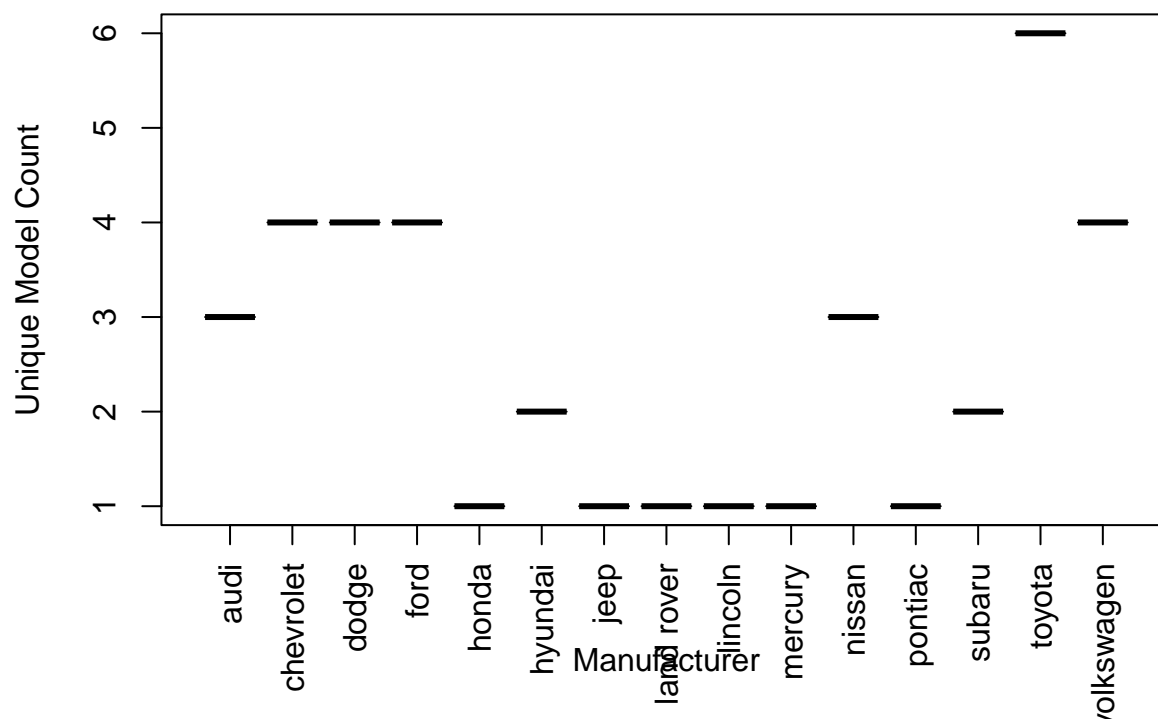
##
## Attaching package: 'ggplot2'
## The following object is masked _by_ '.GlobalEnv':
##
##   mpg

unique_mod$manufacturer <- as.factor(unique_mod$manufacturer)
unique_mod$models <- as.numeric(unique_mod$models)

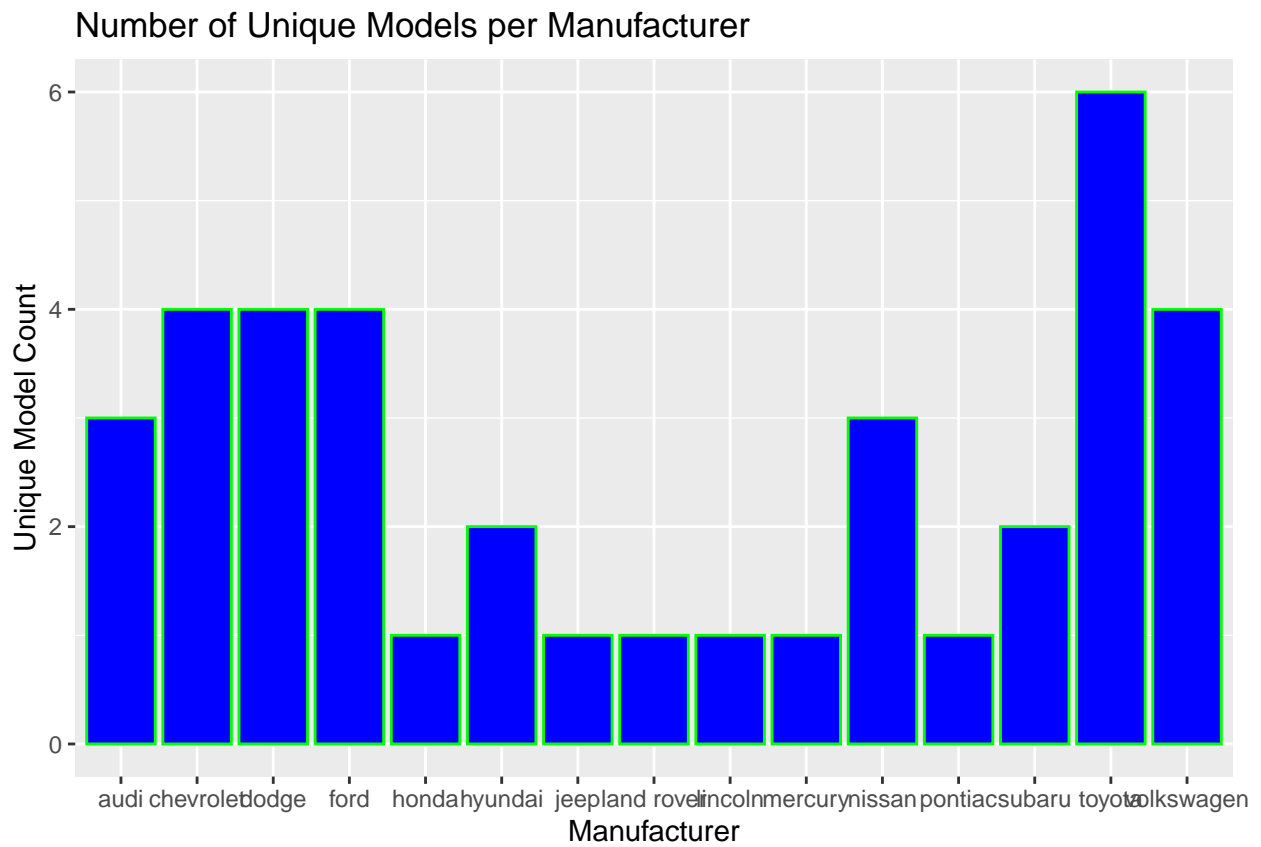
plot(unique_mod$manufacturer, unique_mod$models,
      type = "p",
      col = "orange",
```

```
main = "Number of Unique Models per Manufacturer",
xlab = "Manufacturer",
ylab = "Unique Model Count",
las = 3)
```

Number of Unique Models per Manufacturer

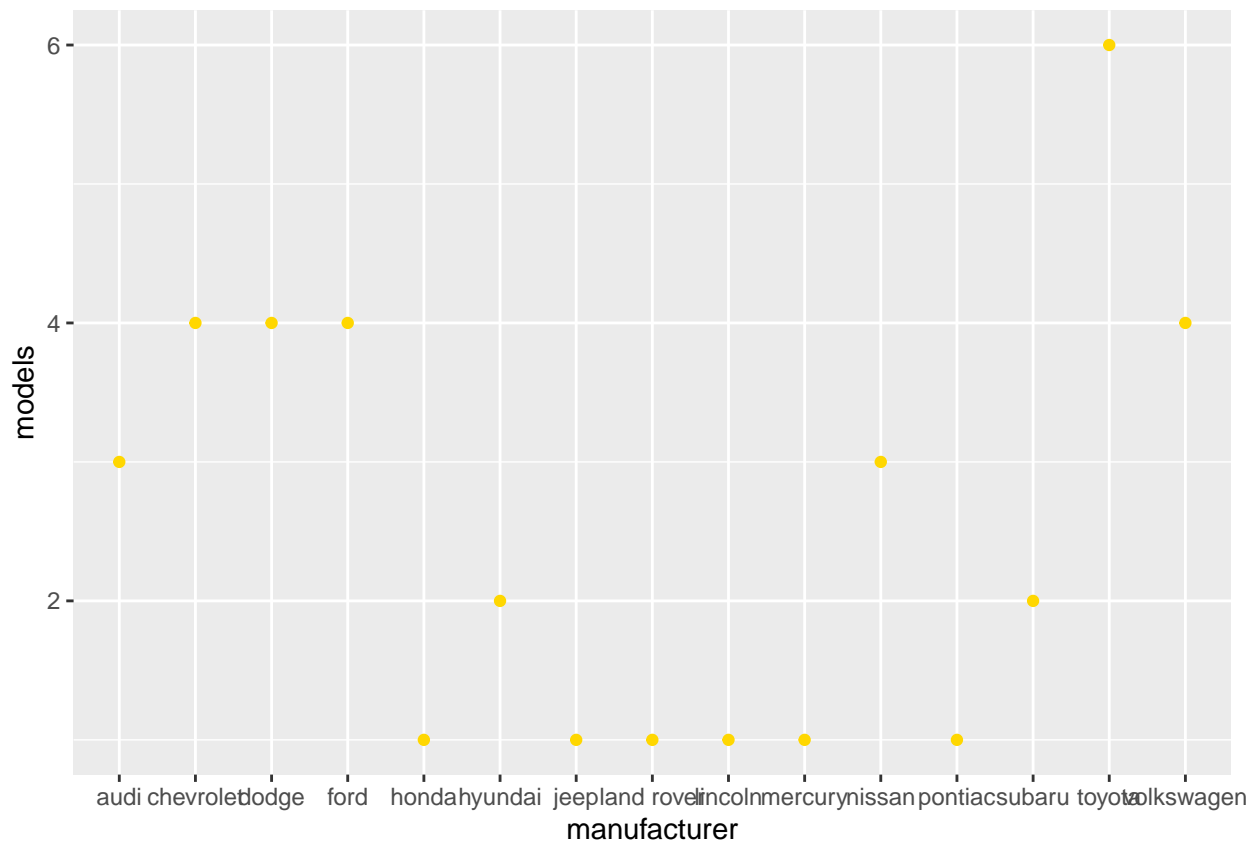


```
ggplot(unique_mod, aes(manufacturer, models), y = models) +
  geom_bar(stat = "identity", fill = "blue", color = "green") +
  labs(title = "Number of Unique Models per Manufacturer", x = "Manufacturer", y = "Unique Model Count")
```



2.

```
library(ggplot2)
ggplot(unique_mod, aes(manufacturer, models), y = models) +
  geom_point( color = "gold")
```



this had shown the representation of the data using point

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

This is quite useful, but if necessary, you can enhance it by transforming the data, summarizing it,

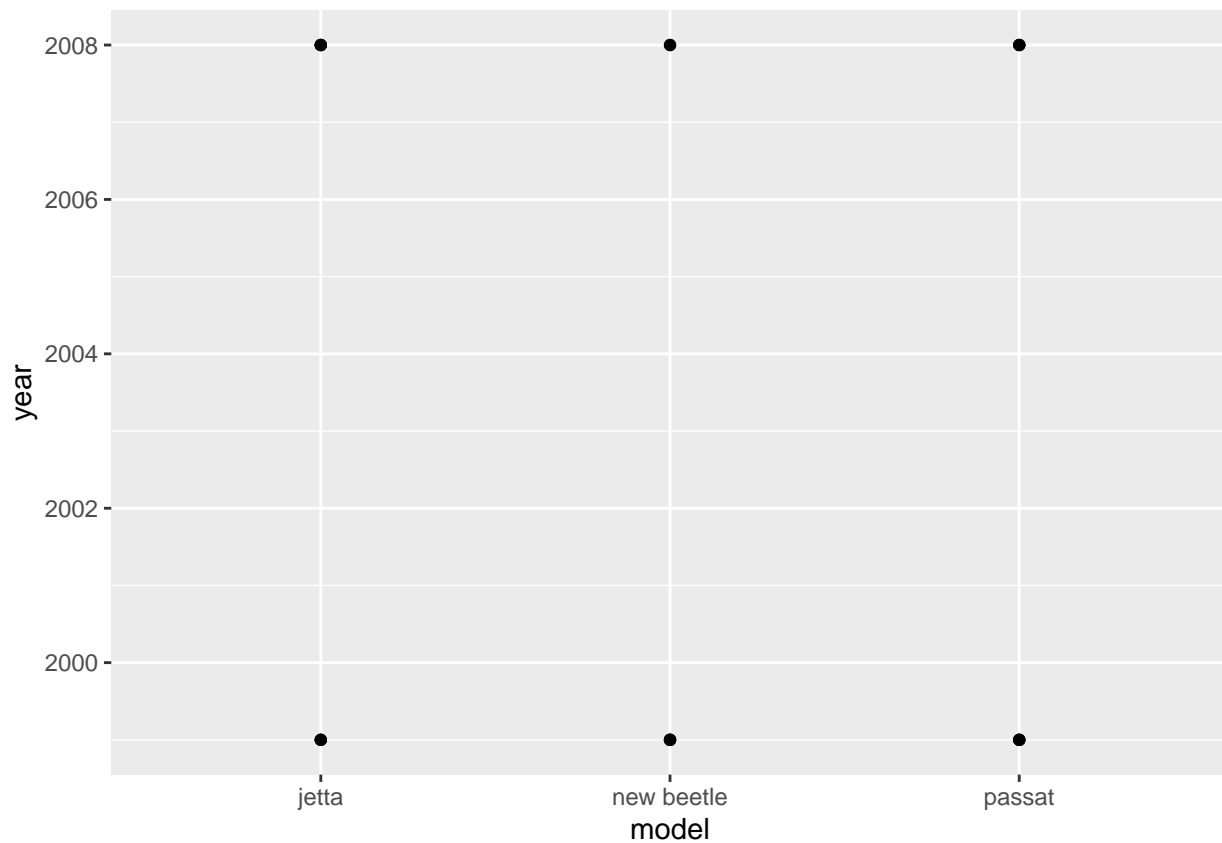
#3. Plot the model and the year using ggplot(). Use only the top 20 observations. Write the codes and its results.

```
top_mpg <- mpg %>%
  arrange(desc(mpg)) %>%
  head(20)
top_mpg
```

| ## | X | manufacturer | model | displ | year | cyl | trans | drv | cty | hwy | fl |
|-------|-----|--------------|------------|-------|------|-----|------------|-----|-----|-----|----|
| ## 1 | 234 | volkswagen | passat | 3.6 | 2008 | 6 | auto(s6) | f | 17 | 26 | p |
| ## 2 | 233 | volkswagen | passat | 2.8 | 1999 | 6 | manual(m5) | f | 18 | 26 | p |
| ## 3 | 232 | volkswagen | passat | 2.8 | 1999 | 6 | auto(l15) | f | 16 | 26 | p |
| ## 4 | 231 | volkswagen | passat | 2.0 | 2008 | 4 | manual(m6) | f | 21 | 29 | p |
| ## 5 | 230 | volkswagen | passat | 2.0 | 2008 | 4 | auto(s6) | f | 19 | 28 | p |
| ## 6 | 229 | volkswagen | passat | 1.8 | 1999 | 4 | auto(l15) | f | 18 | 29 | p |
| ## 7 | 228 | volkswagen | passat | 1.8 | 1999 | 4 | manual(m5) | f | 21 | 29 | p |
| ## 8 | 227 | volkswagen | new beetle | 2.5 | 2008 | 5 | auto(s6) | f | 20 | 29 | r |
| ## 9 | 226 | volkswagen | new beetle | 2.5 | 2008 | 5 | manual(m5) | f | 20 | 28 | r |
| ## 10 | 225 | volkswagen | new beetle | 2.0 | 1999 | 4 | auto(l14) | f | 19 | 26 | r |
| ## 11 | 224 | volkswagen | new beetle | 2.0 | 1999 | 4 | manual(m5) | f | 21 | 29 | r |
| ## 12 | 223 | volkswagen | new beetle | 1.9 | 1999 | 4 | auto(l14) | f | 29 | 41 | d |
| ## 13 | 222 | volkswagen | new beetle | 1.9 | 1999 | 4 | manual(m5) | f | 35 | 44 | d |
| ## 14 | 221 | volkswagen | jetta | 2.8 | 1999 | 6 | manual(m5) | f | 17 | 24 | r |

```
## 15 220 volkswagen jetta 2.8 1999 6 auto(l4) f 16 23 r
## 16 219 volkswagen jetta 2.5 2008 5 manual(m5) f 21 29 r
## 17 218 volkswagen jetta 2.5 2008 5 auto(s6) f 21 29 r
## 18 217 volkswagen jetta 2.0 2008 4 manual(m6) f 21 29 p
## 19 216 volkswagen jetta 2.0 2008 4 auto(s6) f 22 29 p
## 20 215 volkswagen jetta 2.0 1999 4 auto(l4) f 19 26 r
##      class
## 1      midsize
## 2      midsize
## 3      midsize
## 4      midsize
## 5      midsize
## 6      midsize
## 7      midsize
## 8 subcompact
## 9 subcompact
## 10 subcompact
## 11 subcompact
## 12 subcompact
## 13 subcompact
## 14 compact
## 15 compact
## 16 compact
## 17 compact
## 18 compact
## 19 compact
## 20 compact
```

```
ggplot(top_mpg, aes(model,year)) + geom_point()
```



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

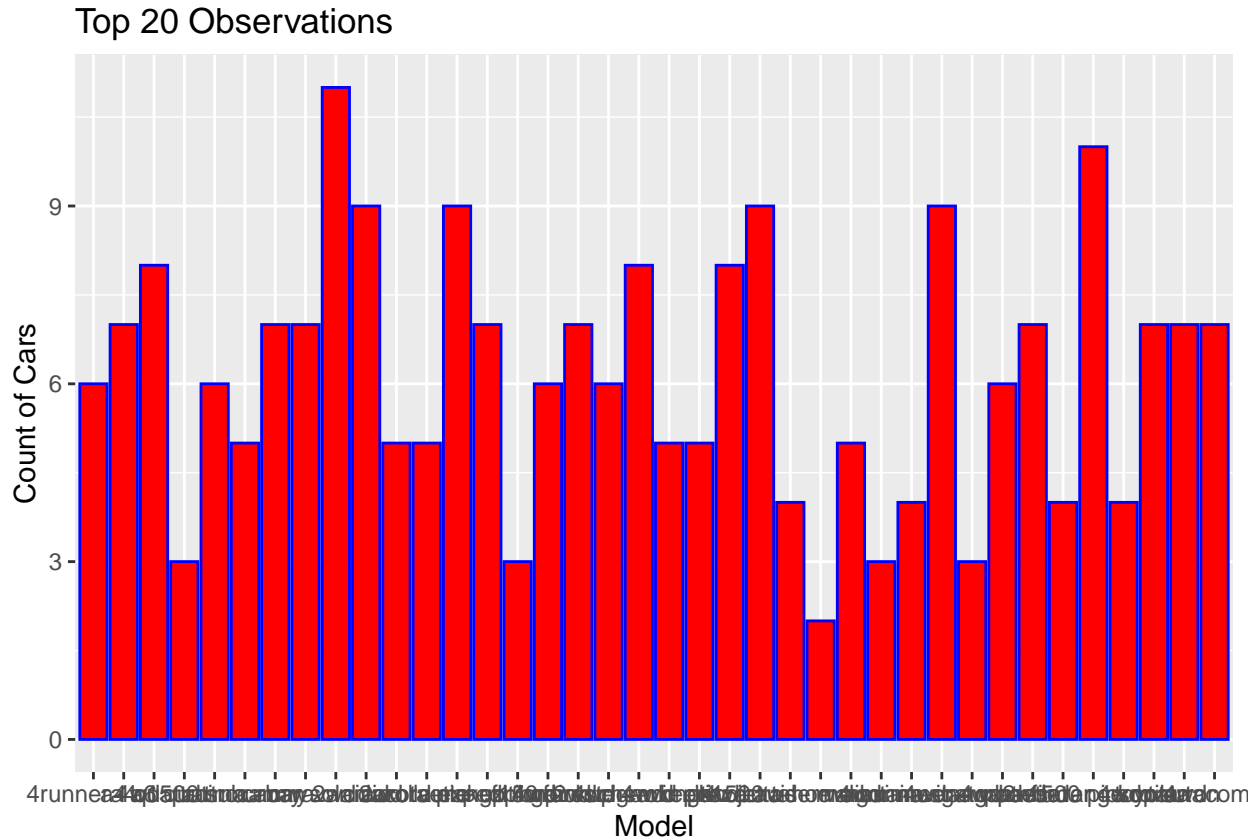
```
car_counted <- mpg %>%
  group_by(model) %>%
  summarise(count = n()) %>%
  arrange(desc(count))

# Display the result
car_counted
```

```
## # A tibble: 38 x 2
##   model          count
##   <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
```

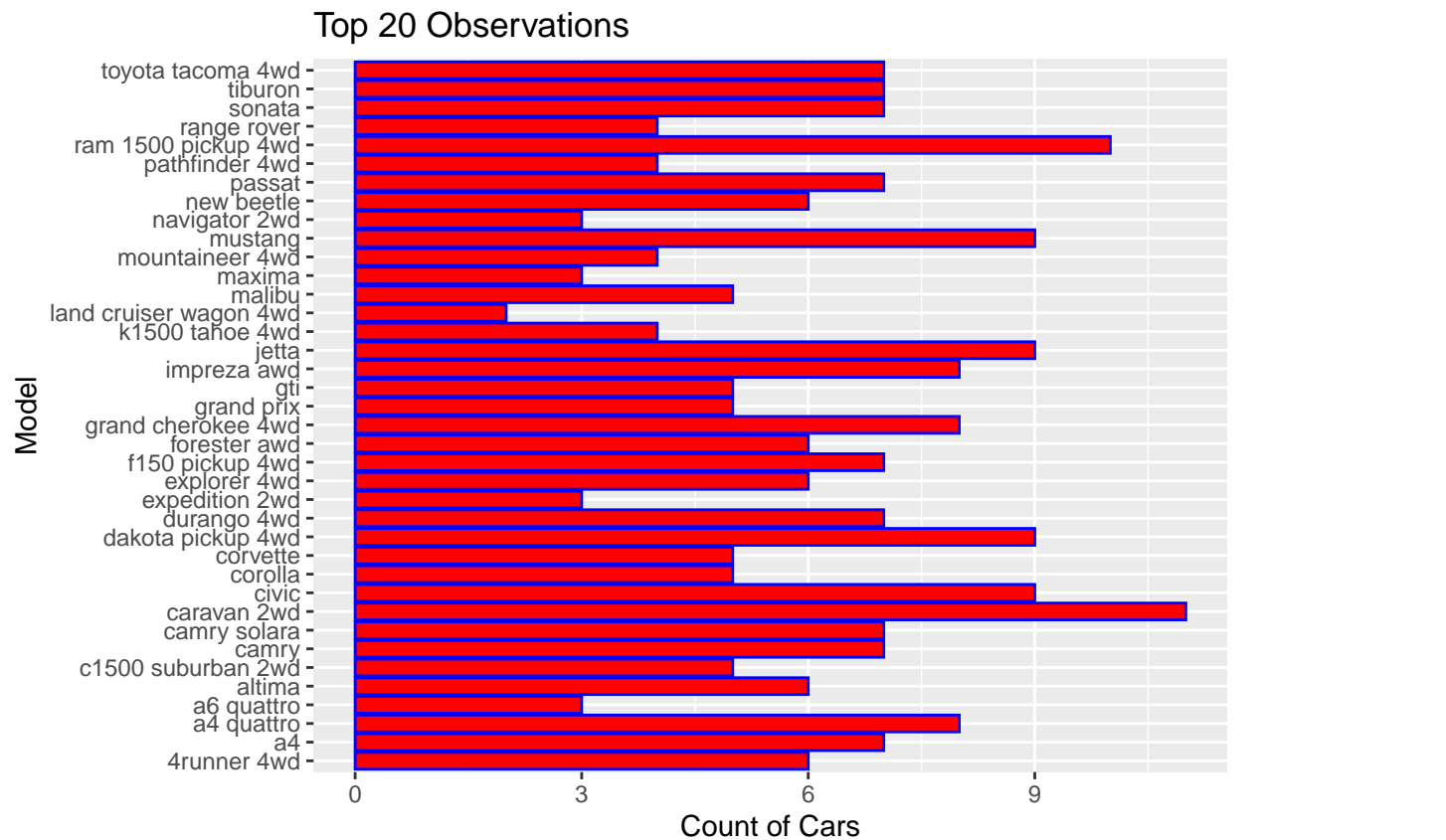

a.

```
ggplot(car_counted, aes(x = model, y = count)) +
  geom_bar(stat = "identity", fill = "red", color = "blue") +
  labs(title = "Top 20 Observations", x = "Model", y = "Count of Cars")
```



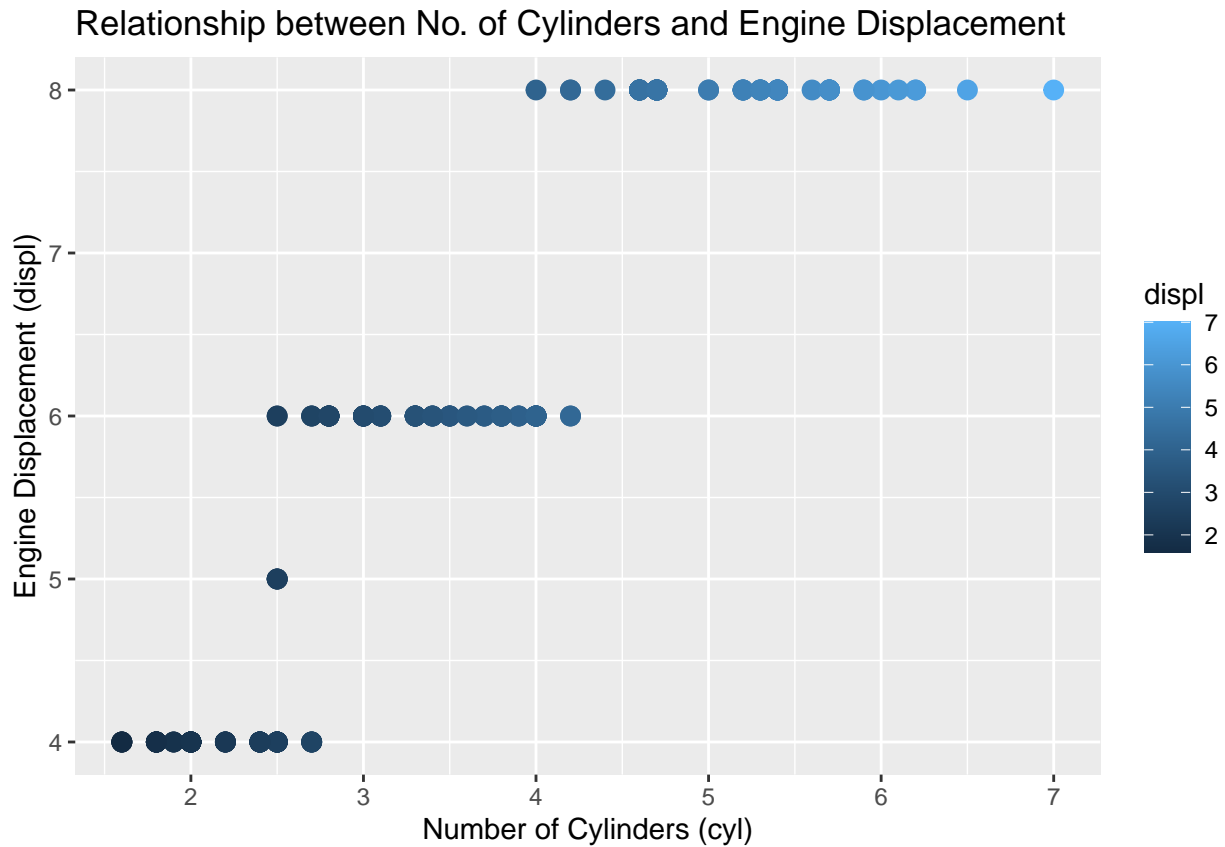
#b.

```
ggplot(car_counted, aes(x = model, y = count)) +
  geom_bar(stat = "identity", fill = "red", color = "blue") +
  labs(title = "Top 20 Observations", x = "Model", y = "Count of Cars") +
  coord_flip()
```



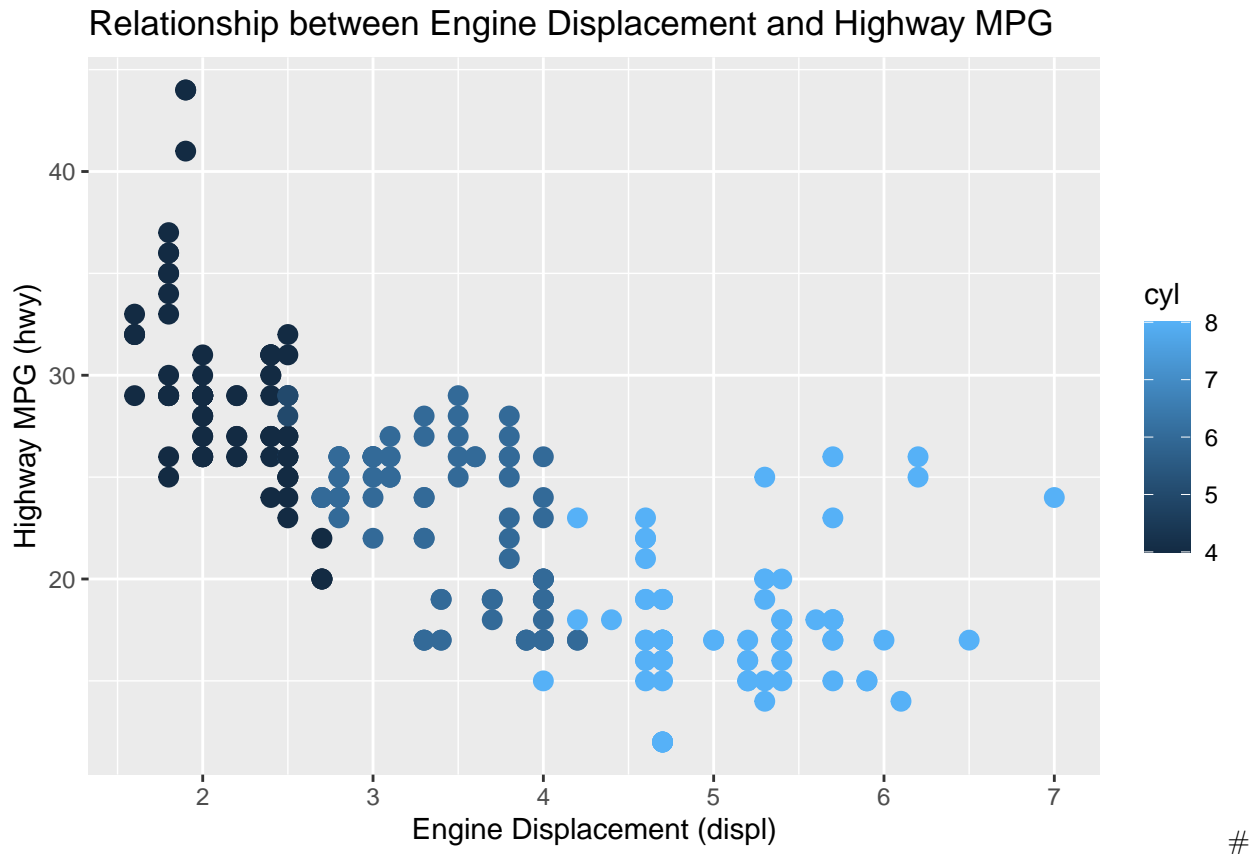
#5.

```
library("ggplot2")
ggplot(mpg, aes(x = displ, y = cyl, color = displ)) + geom_point(size = 3) + labs(title = "Relationship between Engine Displacement (displ) and Number of Cylinders (cyl)",
x = "Number of Cylinders (cyl)",
y = "Engine Displacement (displ)")
```



#6. Plot the relationship between displ (engine displacement) and hwy(highway miles per gallon).

```
ggplot(mpg, aes(x = displ, y = hwy, color = cyl)) +  
  geom_point(size = 3) +  
  labs(title = "Relationship between Engine Displacement and Highway MPG",  
        x = "Engine Displacement (displ)",  
        y = "Highway MPG (hwy)")
```



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

```
traffic <- read.csv("traffic.csv")
```

```
str(traffic)
```

```
## 'data.frame': 48120 obs. of 4 variables:
## $ DateTime: chr "2015-11-01 00:00:00" "2015-11-01 01:00:00" "2015-11-01 02:00:00" "2015-11-01 03:00:00" ...
## $ Junction: int 1 1 1 1 1 1 1 1 1 ...
## $ Vehicles: int 15 13 10 7 9 6 9 8 11 12 ...
## $ ID : num 2.02e+10 2.02e+10 2.02e+10 2.02e+10 2.02e+10 ...
```

The dataset contains 48,120 observations and 4 variables: DateTime, Junction, Vehicles, and ID.

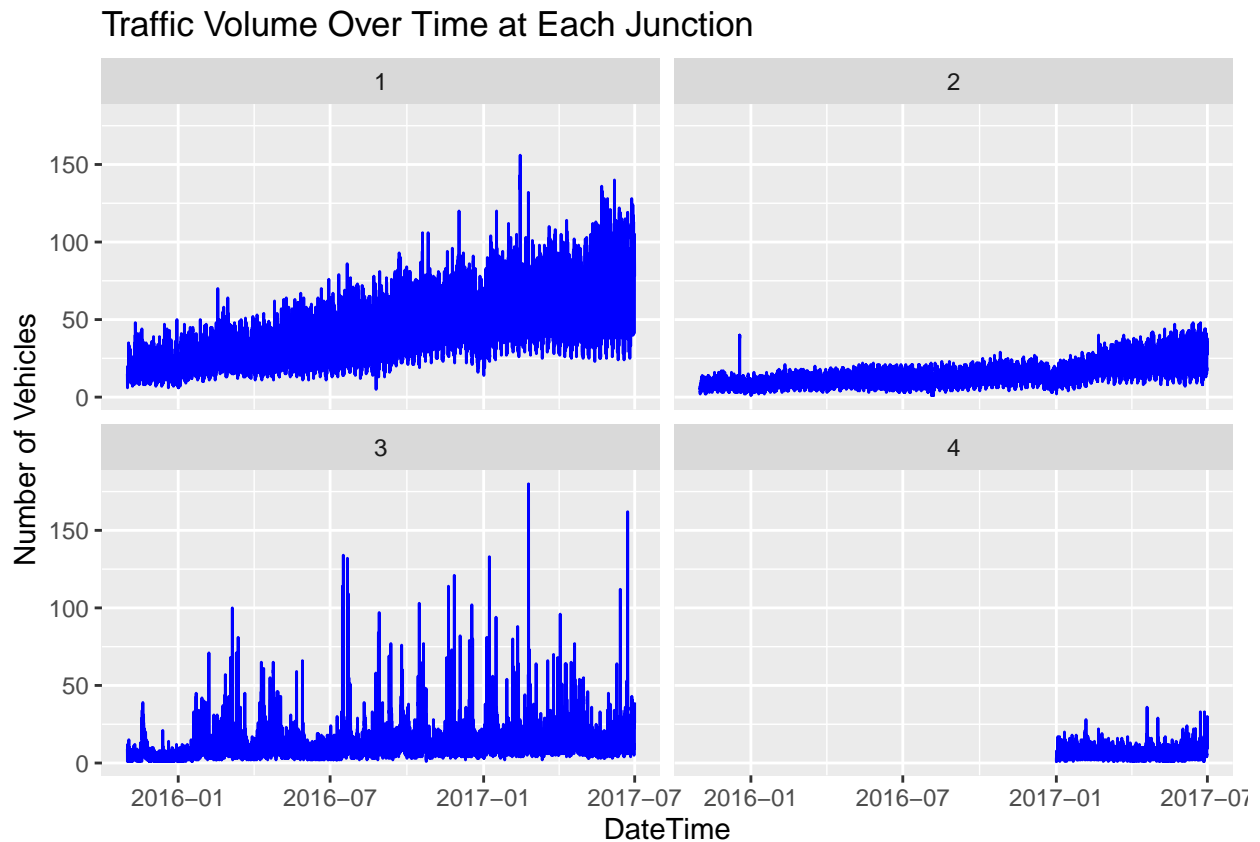
b. subset the traffic dataset into junctions. What is the R codes and its output?

```
junction <- split(traffic, traffic$Junction)
```

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

```
traffic$DateTime <- as.POSIXct(traffic$DateTime, format = "%Y-%m-%d %H:%M:%S")
# Plot each junction using geom_line() and facet_wrap()
```

```
ggplot(traffic, aes(x = DateTime, y = Vehicles)) +
  geom_line(color = "blue") +
  labs(title = "Traffic Volume Over Time at Each Junction",
       x = "DateTime",
       y = "Number of Vehicles") +
  facet_wrap(~ Junction)
```



7.

```
alexa <- read.csv("alexa_file.csv")
```

```
str(alexa)
```

```
## 'data.frame': 3150 obs. of 5 variables:
## $ rating      : int  5 5 4 5 5 5 3 5 5 5 ...
## $ date        : chr  "31-Jul-18" "31-Jul-18" "31-Jul-18" "31-Jul-18" ...
## $ variation    : chr  "Charcoal Fabric " "Charcoal Fabric " "Walnut Finish " "Charcoal Fabric "
## $ verified_reviews: chr  "Love my Echo!" "Loved it!" "Sometimes while playing a game, you can answer"
## $ feedback     : int  1 1 1 1 1 1 1 1 1 1 ...
```

```
ncol(alexa)
```

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

```
# There are 3150 observations and 5 columns in alexafile
```

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

```
print(colnames(alexa))
```

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

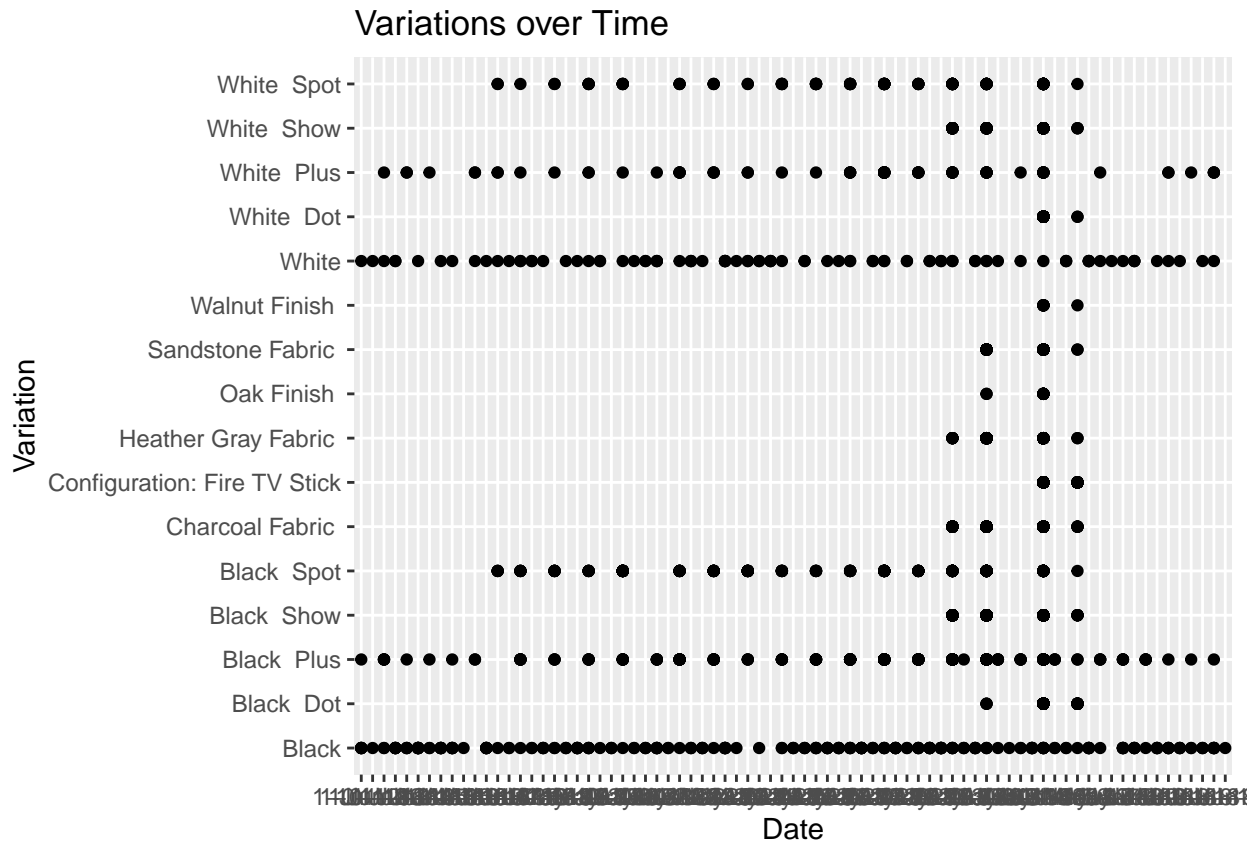
```
## [5] "feedback"
```

```
variation_totals <- alexa %>%  
  group_by(variation) %>%  
    summarise(total = n())  
variation_totals
```

```
## # 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
```

C.

```
library("ggplot2")  
ggplot(alexas, aes(x = date, y = variation)) +  
  geom_point() + labs(title = "Variations over Time", x = "Date", y = "Variation", color = "Verified")
```

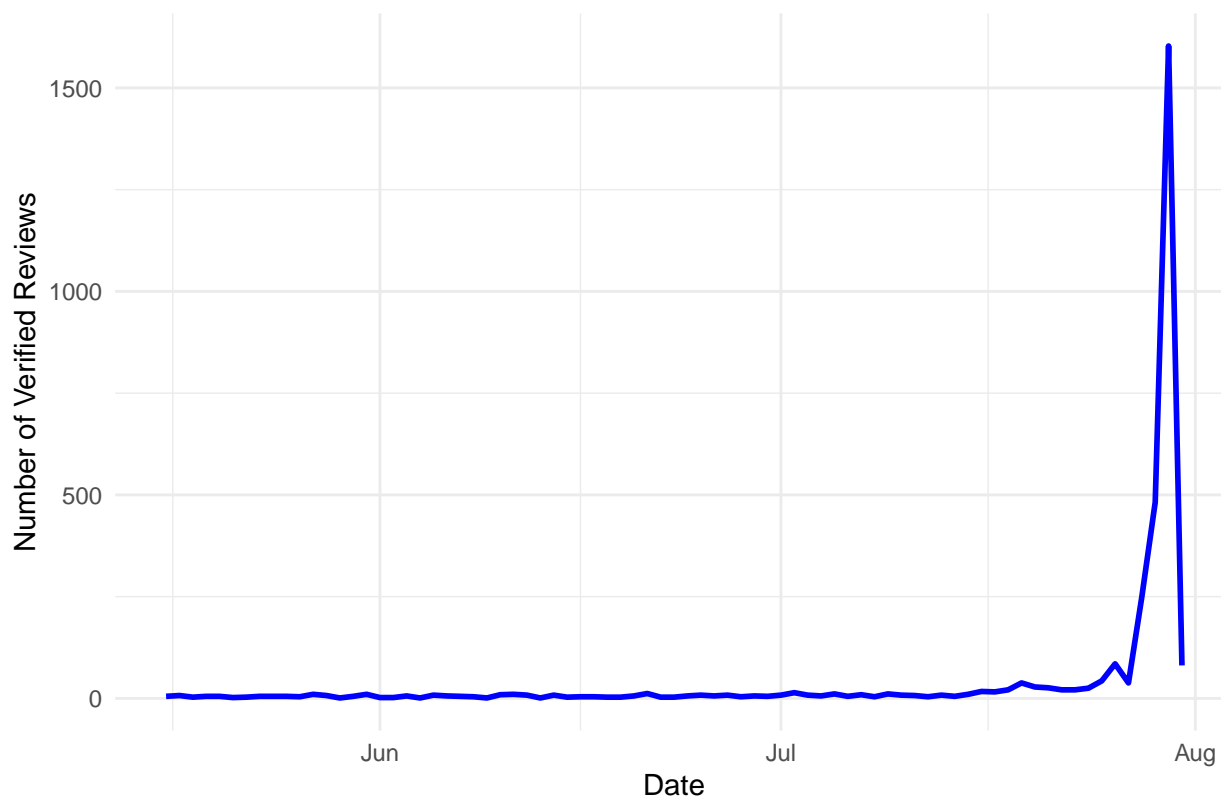


d. Plot a `geom_line()` with the date and the number of verified reviews. Complete the details of the graphs. Show your answer and solution.

```
alexas$date <- as.Date(alexas$date, format = "%d-%b-%y")
review_counts <- alexa %>%
  group_by(date) %>%
  summarise(review_count = n())
ggplot(data = review_counts, aes(x = date, y = review_count)) +
  geom_line(color = "blue", size = 1) +
  labs(
    title = "Number of Verified Reviews Over Time",
    x = "Date",
    y = "Number of Verified Reviews"
  ) +
  theme_minimal()
```

```
## Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use `linewidth` instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.
```

Number of Verified Reviews Over Time



#e.

```
variation_ratings <- alexa %>%
  group_by(variation) %>%
  summarise(average_rating = mean(rating, na.rm = TRUE)) %>%
  arrange(desc(average_rating))

ggplot(variation_ratings, aes(x = reorder(variation, -average_rating), y = average_rating)) +
  geom_bar(stat = "identity", fill = "gold") +
  coord_flip() + # Flip coordinates for better readability
  labs(title = "Average Rating by Product Variation",
       x = "Product Variation",
       y = "Average Rating") +
  theme_minimal()
```