

RWorksheet4c in R

2025-12-10

```
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

library(RColorBrewer)
library(readxl)
library(writexl)
```

1. MPG Dataset

```
data(mpg)
write.csv(mpg, "mpg.csv", row.names = FALSE)

mpg <- read.csv("mpg.csv", stringsAsFactors = FALSE)
mpg

##   manufacturer       model  displ  year cyl trans drv cty hwy
## 1      audi           a4    1.8 1999    4 auto(l5)  f 18 29
## 2      audi           a4    1.8 1999    4 manual(m5)  f 21 29
## 3      audi           a4    2.0 2008    4 manual(m6)  f 20 31
## 4      audi           a4    2.0 2008    4 auto(av)   f 21 30
## 5      audi           a4    2.8 1999    6 auto(l5)   f 16 26
## 6      audi           a4    2.8 1999    6 manual(m5)  f 18 26
## 7      audi           a4    3.1 2008    6 auto(av)   f 18 27
## 8      audi          a4 quattro 1.8 1999    4 manual(m5)  4 18 26
## 9      audi          a4 quattro 1.8 1999    4 auto(l5)   4 16 25
## 10     audi          a4 quattro 2.0 2008    4 manual(m6)  4 20 28
## 11     audi          a4 quattro 2.0 2008    4 auto(s6)   4 19 27
## 12     audi          a4 quattro 2.8 1999    6 auto(l5)   4 15 25
## 13     audi          a4 quattro 2.8 1999    6 manual(m5)  4 17 25
## 14     audi          a4 quattro 3.1 2008    6 auto(s6)   4 17 25
## 15     audi          a4 quattro 3.1 2008    6 manual(m6)  4 15 25
## 16     audi          a6 quattro 2.8 1999    6 auto(l5)   4 15 24
## 17     audi          a6 quattro 3.1 2008    6 auto(s6)   4 17 25
## 18     audi          a6 quattro 4.2 2008    8 auto(s6)   4 16 23
## 19  chevrolet  c1500 suburban 2wd  5.3 2008    8 auto(l4)   r 14 20
```

## 20	chevrolet	c1500 suburban 2wd	5.3	2008	8	auto(14)	r	11	15
## 21	chevrolet	c1500 suburban 2wd	5.3	2008	8	auto(14)	r	14	20
## 22	chevrolet	c1500 suburban 2wd	5.7	1999	8	auto(14)	r	13	17
## 23	chevrolet	c1500 suburban 2wd	6.0	2008	8	auto(14)	r	12	17
## 24	chevrolet	corvette	5.7	1999	8	manual(m6)	r	16	26
## 25	chevrolet	corvette	5.7	1999	8	auto(14)	r	15	23
## 26	chevrolet	corvette	6.2	2008	8	manual(m6)	r	16	26
## 27	chevrolet	corvette	6.2	2008	8	auto(s6)	r	15	25
## 28	chevrolet	corvette	7.0	2008	8	manual(m6)	r	15	24
## 29	chevrolet	k1500 tahoe 4wd	5.3	2008	8	auto(14)	f	14	19
## 30	chevrolet	k1500 tahoe 4wd	5.3	2008	8	auto(14)	f	11	14
## 31	chevrolet	k1500 tahoe 4wd	5.7	1999	8	auto(14)	f	11	15
## 32	chevrolet	k1500 tahoe 4wd	6.5	1999	8	auto(14)	f	14	17
## 33	chevrolet	malibu	2.4	1999	4	auto(14)	f	19	27
## 34	chevrolet	malibu	2.4	2008	4	auto(14)	f	22	30
## 35	chevrolet	malibu	3.1	1999	6	auto(14)	f	18	26
## 36	chevrolet	malibu	3.5	2008	6	auto(14)	f	18	29
## 37	chevrolet	malibu	3.6	2008	6	auto(s6)	f	17	26
## 38	dodge	caravan 2wd	2.4	1999	4	auto(13)	f	18	24
## 39	dodge	caravan 2wd	3.0	1999	6	auto(14)	f	17	24
## 40	dodge	caravan 2wd	3.3	1999	6	auto(14)	f	16	22
## 41	dodge	caravan 2wd	3.3	1999	6	auto(14)	f	16	22
## 42	dodge	caravan 2wd	3.3	2008	6	auto(14)	f	17	24
## 43	dodge	caravan 2wd	3.3	2008	6	auto(14)	f	17	24
## 44	dodge	caravan 2wd	3.3	2008	6	auto(14)	f	11	17
## 45	dodge	caravan 2wd	3.8	1999	6	auto(14)	f	15	22
## 46	dodge	caravan 2wd	3.8	1999	6	auto(14)	f	15	21
## 47	dodge	caravan 2wd	3.8	2008	6	auto(16)	f	16	23
## 48	dodge	caravan 2wd	4.0	2008	6	auto(16)	f	16	23
## 49	dodge	dakota pickup 4wd	3.7	2008	6	manual(m6)	f	15	19
## 50	dodge	dakota pickup 4wd	3.7	2008	6	auto(14)	f	14	18
## 51	dodge	dakota pickup 4wd	3.9	1999	6	auto(14)	f	13	17
## 52	dodge	dakota pickup 4wd	3.9	1999	6	manual(m5)	f	14	17
## 53	dodge	dakota pickup 4wd	4.7	2008	8	auto(15)	f	14	19
## 54	dodge	dakota pickup 4wd	4.7	2008	8	auto(15)	f	14	19
## 55	dodge	dakota pickup 4wd	4.7	2008	8	auto(15)	f	9	12
## 56	dodge	dakota pickup 4wd	5.2	1999	8	manual(m5)	f	11	17
## 57	dodge	dakota pickup 4wd	5.2	1999	8	auto(14)	f	11	15
## 58	dodge	durango 4wd	3.9	1999	6	auto(14)	f	13	17
## 59	dodge	durango 4wd	4.7	2008	8	auto(15)	f	13	17
## 60	dodge	durango 4wd	4.7	2008	8	auto(15)	f	9	12
## 61	dodge	durango 4wd	4.7	2008	8	auto(15)	f	13	17
## 62	dodge	durango 4wd	5.2	1999	8	auto(14)	f	11	16
## 63	dodge	durango 4wd	5.7	2008	8	auto(15)	f	13	18
## 64	dodge	durango 4wd	5.9	1999	8	auto(14)	f	11	15
## 65	dodge	ram 1500 pickup 4wd	4.7	2008	8	manual(m6)	f	12	16
## 66	dodge	ram 1500 pickup 4wd	4.7	2008	8	auto(15)	f	9	12
## 67	dodge	ram 1500 pickup 4wd	4.7	2008	8	auto(15)	f	13	17
## 68	dodge	ram 1500 pickup 4wd	4.7	2008	8	auto(15)	f	13	17
## 69	dodge	ram 1500 pickup 4wd	4.7	2008	8	manual(m6)	f	12	16
## 70	dodge	ram 1500 pickup 4wd	4.7	2008	8	manual(m6)	f	9	12
## 71	dodge	ram 1500 pickup 4wd	5.2	1999	8	auto(14)	f	11	15
## 72	dodge	ram 1500 pickup 4wd	5.2	1999	8	manual(m5)	f	11	16
## 73	dodge	ram 1500 pickup 4wd	5.7	2008	8	auto(15)	f	13	17

## 74	dodge	ram 1500 pickup 4wd	5.9	1999	8	auto(14)	4	11	15
## 75	ford	expedition 2wd	4.6	1999	8	auto(14)	r	11	17
## 76	ford	expedition 2wd	5.4	1999	8	auto(14)	r	11	17
## 77	ford	expedition 2wd	5.4	2008	8	auto(16)	r	12	18
## 78	ford	explorer 4wd	4.0	1999	6	auto(15)	4	14	17
## 79	ford	explorer 4wd	4.0	1999	6	manual(m5)	4	15	19
## 80	ford	explorer 4wd	4.0	1999	6	auto(15)	4	14	17
## 81	ford	explorer 4wd	4.0	2008	6	auto(15)	4	13	19
## 82	ford	explorer 4wd	4.6	2008	8	auto(16)	4	13	19
## 83	ford	explorer 4wd	5.0	1999	8	auto(14)	4	13	17
## 84	ford	f150 pickup 4wd	4.2	1999	6	auto(14)	4	14	17
## 85	ford	f150 pickup 4wd	4.2	1999	6	manual(m5)	4	14	17
## 86	ford	f150 pickup 4wd	4.6	1999	8	manual(m5)	4	13	16
## 87	ford	f150 pickup 4wd	4.6	1999	8	auto(14)	4	13	16
## 88	ford	f150 pickup 4wd	4.6	2008	8	auto(14)	4	13	17
## 89	ford	f150 pickup 4wd	5.4	1999	8	auto(14)	4	11	15
## 90	ford	f150 pickup 4wd	5.4	2008	8	auto(14)	4	13	17
## 91	ford	mustang	3.8	1999	6	manual(m5)	r	18	26
## 92	ford	mustang	3.8	1999	6	auto(14)	r	18	25
## 93	ford	mustang	4.0	2008	6	manual(m5)	r	17	26
## 94	ford	mustang	4.0	2008	6	auto(15)	r	16	24
## 95	ford	mustang	4.6	1999	8	auto(14)	r	15	21
## 96	ford	mustang	4.6	1999	8	manual(m5)	r	15	22
## 97	ford	mustang	4.6	2008	8	manual(m5)	r	15	23
## 98	ford	mustang	4.6	2008	8	auto(15)	r	15	22
## 99	ford	mustang	5.4	2008	8	manual(m6)	r	14	20
## 100	honda	civic	1.6	1999	4	manual(m5)	f	28	33
## 101	honda	civic	1.6	1999	4	auto(14)	f	24	32
## 102	honda	civic	1.6	1999	4	manual(m5)	f	25	32
## 103	honda	civic	1.6	1999	4	manual(m5)	f	23	29
## 104	honda	civic	1.6	1999	4	auto(14)	f	24	32
## 105	honda	civic	1.8	2008	4	manual(m5)	f	26	34
## 106	honda	civic	1.8	2008	4	auto(15)	f	25	36
## 107	honda	civic	1.8	2008	4	auto(15)	f	24	36
## 108	honda	civic	2.0	2008	4	manual(m6)	f	21	29
## 109	hyundai	sonata	2.4	1999	4	auto(14)	f	18	26
## 110	hyundai	sonata	2.4	1999	4	manual(m5)	f	18	27
## 111	hyundai	sonata	2.4	2008	4	auto(14)	f	21	30
## 112	hyundai	sonata	2.4	2008	4	manual(m5)	f	21	31
## 113	hyundai	sonata	2.5	1999	6	auto(14)	f	18	26
## 114	hyundai	sonata	2.5	1999	6	manual(m5)	f	18	26
## 115	hyundai	sonata	3.3	2008	6	auto(15)	f	19	28
## 116	hyundai	tiburon	2.0	1999	4	auto(14)	f	19	26
## 117	hyundai	tiburon	2.0	1999	4	manual(m5)	f	19	29
## 118	hyundai	tiburon	2.0	2008	4	manual(m5)	f	20	28
## 119	hyundai	tiburon	2.0	2008	4	auto(14)	f	20	27
## 120	hyundai	tiburon	2.7	2008	6	auto(14)	f	17	24
## 121	hyundai	tiburon	2.7	2008	6	manual(m6)	f	16	24
## 122	hyundai	tiburon	2.7	2008	6	manual(m5)	f	17	24
## 123	jeep	grand cherokee 4wd	3.0	2008	6	auto(15)	4	17	22
## 124	jeep	grand cherokee 4wd	3.7	2008	6	auto(15)	4	15	19
## 125	jeep	grand cherokee 4wd	4.0	1999	6	auto(14)	4	15	20
## 126	jeep	grand cherokee 4wd	4.7	1999	8	auto(14)	4	14	17
## 127	jeep	grand cherokee 4wd	4.7	2008	8	auto(15)	4	9	12

## 128	jeep	grand cherokee 4wd	4.7	2008	8	auto(15)	4	14	19
## 129	jeep	grand cherokee 4wd	5.7	2008	8	auto(15)	4	13	18
## 130	jeep	grand cherokee 4wd	6.1	2008	8	auto(15)	4	11	14
## 131	land rover	range rover	4.0	1999	8	auto(14)	4	11	15
## 132	land rover	range rover	4.2	2008	8	auto(s6)	4	12	18
## 133	land rover	range rover	4.4	2008	8	auto(s6)	4	12	18
## 134	land rover	range rover	4.6	1999	8	auto(14)	4	11	15
## 135	lincoln	navigator 2wd	5.4	1999	8	auto(14)	r	11	17
## 136	lincoln	navigator 2wd	5.4	1999	8	auto(14)	r	11	16
## 137	lincoln	navigator 2wd	5.4	2008	8	auto(16)	r	12	18
## 138	mercury	mountaineer 4wd	4.0	1999	6	auto(15)	4	14	17
## 139	mercury	mountaineer 4wd	4.0	2008	6	auto(15)	4	13	19
## 140	mercury	mountaineer 4wd	4.6	2008	8	auto(16)	4	13	19
## 141	mercury	mountaineer 4wd	5.0	1999	8	auto(14)	4	13	17
## 142	nissan	altima	2.4	1999	4	manual(m5)	f	21	29
## 143	nissan	altima	2.4	1999	4	auto(14)	f	19	27
## 144	nissan	altima	2.5	2008	4	auto(av)	f	23	31
## 145	nissan	altima	2.5	2008	4	manual(m6)	f	23	32
## 146	nissan	altima	3.5	2008	6	manual(m6)	f	19	27
## 147	nissan	altima	3.5	2008	6	auto(av)	f	19	26
## 148	nissan	maxima	3.0	1999	6	auto(14)	f	18	26
## 149	nissan	maxima	3.0	1999	6	manual(m5)	f	19	25
## 150	nissan	maxima	3.5	2008	6	auto(av)	f	19	25
## 151	nissan	pathfinder 4wd	3.3	1999	6	auto(14)	4	14	17
## 152	nissan	pathfinder 4wd	3.3	1999	6	manual(m5)	4	15	17
## 153	nissan	pathfinder 4wd	4.0	2008	6	auto(15)	4	14	20
## 154	nissan	pathfinder 4wd	5.6	2008	8	auto(s5)	4	12	18
## 155	pontiac	grand prix	3.1	1999	6	auto(14)	f	18	26
## 156	pontiac	grand prix	3.8	1999	6	auto(14)	f	16	26
## 157	pontiac	grand prix	3.8	1999	6	auto(14)	f	17	27
## 158	pontiac	grand prix	3.8	2008	6	auto(14)	f	18	28
## 159	pontiac	grand prix	5.3	2008	8	auto(s4)	f	16	25
## 160	subaru	forester awd	2.5	1999	4	manual(m5)	4	18	25
## 161	subaru	forester awd	2.5	1999	4	auto(14)	4	18	24
## 162	subaru	forester awd	2.5	2008	4	manual(m5)	4	20	27
## 163	subaru	forester awd	2.5	2008	4	manual(m5)	4	19	25
## 164	subaru	forester awd	2.5	2008	4	auto(14)	4	20	26
## 165	subaru	forester awd	2.5	2008	4	auto(14)	4	18	23
## 166	subaru	impreza awd	2.2	1999	4	auto(14)	4	21	26
## 167	subaru	impreza awd	2.2	1999	4	manual(m5)	4	19	26
## 168	subaru	impreza awd	2.5	1999	4	manual(m5)	4	19	26
## 169	subaru	impreza awd	2.5	1999	4	auto(14)	4	19	26
## 170	subaru	impreza awd	2.5	2008	4	auto(s4)	4	20	25
## 171	subaru	impreza awd	2.5	2008	4	auto(s4)	4	20	27
## 172	subaru	impreza awd	2.5	2008	4	manual(m5)	4	19	25
## 173	subaru	impreza awd	2.5	2008	4	manual(m5)	4	20	27
## 174	toyota	4runner 4wd	2.7	1999	4	manual(m5)	4	15	20
## 175	toyota	4runner 4wd	2.7	1999	4	auto(14)	4	16	20
## 176	toyota	4runner 4wd	3.4	1999	6	auto(14)	4	15	19
## 177	toyota	4runner 4wd	3.4	1999	6	manual(m5)	4	15	17
## 178	toyota	4runner 4wd	4.0	2008	6	auto(15)	4	16	20
## 179	toyota	4runner 4wd	4.7	2008	8	auto(15)	4	14	17
## 180	toyota	camry	2.2	1999	4	manual(m5)	f	21	29
## 181	toyota	camry	2.2	1999	4	auto(14)	f	21	27

## 182	toyota	camry	2.4	2008	4	manual(m5)	f	21	31
## 183	toyota	camry	2.4	2008	4	auto(15)	f	21	31
## 184	toyota	camry	3.0	1999	6	auto(14)	f	18	26
## 185	toyota	camry	3.0	1999	6	manual(m5)	f	18	26
## 186	toyota	camry	3.5	2008	6	auto(s6)	f	19	28
## 187	toyota	camry solara	2.2	1999	4	auto(14)	f	21	27
## 188	toyota	camry solara	2.2	1999	4	manual(m5)	f	21	29
## 189	toyota	camry solara	2.4	2008	4	manual(m5)	f	21	31
## 190	toyota	camry solara	2.4	2008	4	auto(s5)	f	22	31
## 191	toyota	camry solara	3.0	1999	6	auto(14)	f	18	26
## 192	toyota	camry solara	3.0	1999	6	manual(m5)	f	18	26
## 193	toyota	camry solara	3.3	2008	6	auto(s5)	f	18	27
## 194	toyota	corolla	1.8	1999	4	auto(13)	f	24	30
## 195	toyota	corolla	1.8	1999	4	auto(14)	f	24	33
## 196	toyota	corolla	1.8	1999	4	manual(m5)	f	26	35
## 197	toyota	corolla	1.8	2008	4	manual(m5)	f	28	37
## 198	toyota	corolla	1.8	2008	4	auto(14)	f	26	35
## 199	toyota land cruiser	wagon 4wd	4.7	1999	8	auto(14)	f	11	15
## 200	toyota land cruiser	wagon 4wd	5.7	2008	8	auto(s6)	f	13	18
## 201	toyota	toyota tacoma 4wd	2.7	1999	4	manual(m5)	f	15	20
## 202	toyota	toyota tacoma 4wd	2.7	1999	4	auto(14)	f	16	20
## 203	toyota	toyota tacoma 4wd	2.7	2008	4	manual(m5)	f	17	22
## 204	toyota	toyota tacoma 4wd	3.4	1999	6	manual(m5)	f	15	17
## 205	toyota	toyota tacoma 4wd	3.4	1999	6	auto(14)	f	15	19
## 206	toyota	toyota tacoma 4wd	4.0	2008	6	manual(m6)	f	15	18
## 207	toyota	toyota tacoma 4wd	4.0	2008	6	auto(15)	f	16	20
## 208	volkswagen	gti	2.0	1999	4	manual(m5)	f	21	29
## 209	volkswagen	gti	2.0	1999	4	auto(14)	f	19	26
## 210	volkswagen	gti	2.0	2008	4	manual(m6)	f	21	29
## 211	volkswagen	gti	2.0	2008	4	auto(s6)	f	22	29
## 212	volkswagen	gti	2.8	1999	6	manual(m5)	f	17	24
## 213	volkswagen	jetta	1.9	1999	4	manual(m5)	f	33	44
## 214	volkswagen	jetta	2.0	1999	4	manual(m5)	f	21	29
## 215	volkswagen	jetta	2.0	1999	4	auto(14)	f	19	26
## 216	volkswagen	jetta	2.0	2008	4	auto(s6)	f	22	29
## 217	volkswagen	jetta	2.0	2008	4	manual(m6)	f	21	29
## 218	volkswagen	jetta	2.5	2008	5	auto(s6)	f	21	29
## 219	volkswagen	jetta	2.5	2008	5	manual(m5)	f	21	29
## 220	volkswagen	jetta	2.8	1999	6	auto(14)	f	16	23
## 221	volkswagen	jetta	2.8	1999	6	manual(m5)	f	17	24
## 222	volkswagen	new beetle	1.9	1999	4	manual(m5)	f	35	44
## 223	volkswagen	new beetle	1.9	1999	4	auto(14)	f	29	41
## 224	volkswagen	new beetle	2.0	1999	4	manual(m5)	f	21	29
## 225	volkswagen	new beetle	2.0	1999	4	auto(14)	f	19	26
## 226	volkswagen	new beetle	2.5	2008	5	manual(m5)	f	20	28
## 227	volkswagen	new beetle	2.5	2008	5	auto(s6)	f	20	29
## 228	volkswagen	passat	1.8	1999	4	manual(m5)	f	21	29
## 229	volkswagen	passat	1.8	1999	4	auto(15)	f	18	29
## 230	volkswagen	passat	2.0	2008	4	auto(s6)	f	19	28
## 231	volkswagen	passat	2.0	2008	4	manual(m6)	f	21	29
## 232	volkswagen	passat	2.8	1999	6	auto(15)	f	16	26
## 233	volkswagen	passat	2.8	1999	6	manual(m5)	f	18	26
## 234	volkswagen	passat	3.6	2008	6	auto(s6)	f	17	26
##	f1	class							

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

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

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

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

```

## 217 p compact
## 218 r compact
## 219 r compact
## 220 r compact
## 221 r compact
## 222 d subcompact
## 223 d subcompact
## 224 r subcompact
## 225 r subcompact
## 226 r subcompact
## 227 r subcompact
## 228 p midsize
## 229 p midsize
## 230 p midsize
## 231 p midsize
## 232 p midsize
## 233 p midsize
## 234 p midsize

str(mpg)

## 'data.frame': 234 obs. of 11 variables:
## $ manufacturer: chr "audi" "audi" "audi" "audi" ...
## $ model       : chr "a4" "a4" "a4" "a4" ...
## $ displ        : num 1.8 1.8 2 2 2.8 2.8 3.1 1.8 1.8 2 ...
## $ year         : int 1999 1999 2008 2008 1999 1999 2008 1999 1999 2008 ...
## $ cyl          : int 4 4 4 4 6 6 6 4 4 4 ...
## $ trans        : chr "auto(l5)" "manual(m5)" "manual(m6)" "auto(av)" ...
## $ drv          : chr "f" "f" "f" "f" ...
## $ cty          : int 18 21 20 21 16 18 18 18 16 20 ...
## $ hwy          : int 29 29 31 30 26 26 27 26 25 28 ...
## $ fl           : chr "p" "p" "p" "p" ...
## $ class        : chr "compact" "compact" "compact" "compact" ...

```

2. Models by Manufacturer

```

mpg %>%
  group_by(manufacturer) %>%
  summarise(models = n_distinct(model))

## # 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

unique_models <- mpg %>%
  group_by(manufacturer) %>%
  summarise(unique_models = n_distinct(model)) %>%
  arrange(desc(unique_models))

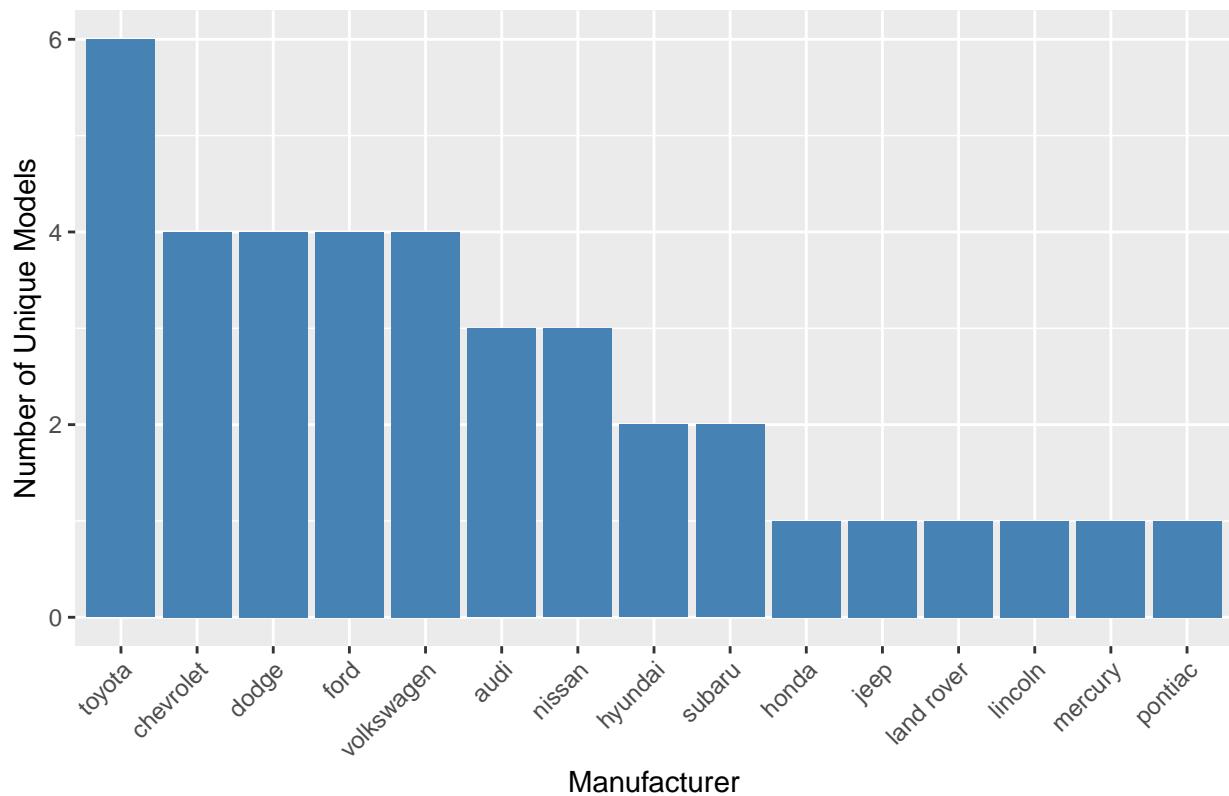
unique_models

## # 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

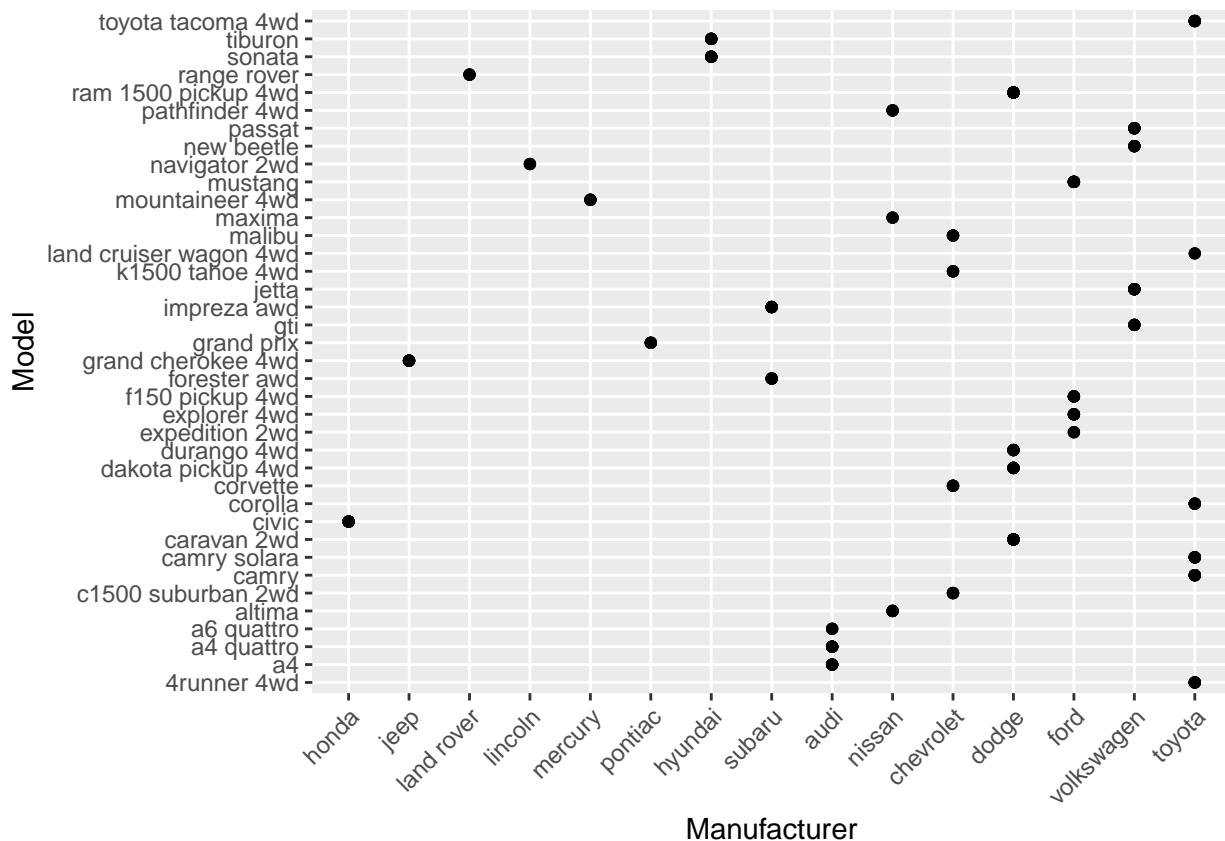
ggplot(unique_models, aes(x = reorder(manufacturer, -unique_models), y = unique_models)) +
  geom_bar(stat = "identity", fill = "steelblue") +
  xlab("Manufacturer") +
  ylab("Number of Unique Models") +
  ggtitle("Number of Unique Models by Manufacturer") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))

```

Number of Unique Models by Manufacturer



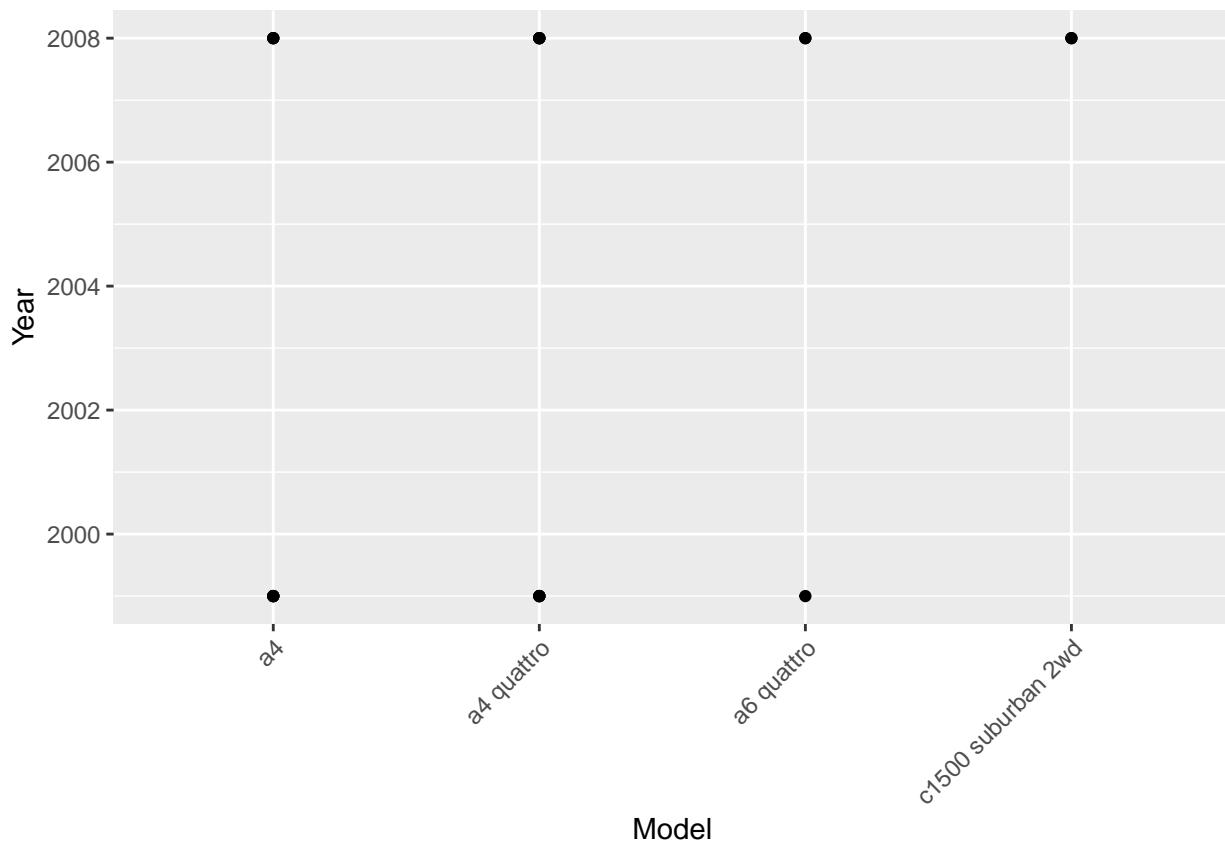
```
ggplot(mpg, aes(x = reorder(manufacturer, model, function(x) length(unique(x))), y = model)) +  
  geom_point() +  
  xlab("Manufacturer") +  
  ylab("Model") +  
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```



3. Top 20 Models

```
top_20 <- head(mpg, 20)

ggplot(top_20, aes(x = model, y = year)) +
  geom_point() +
  xlab("Model") +
  ylab("Year") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```



4. Car Model Frequency

```

mpg %>%
  group_by(model) %>%
  summarise(count = n()) %>%
  arrange(desc(count))

## # 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

top_20_models <- mpg %>%
  group_by(model) %>%
  summarise(count = n()) %>%
  arrange(desc(count)) %>%
  head(20)

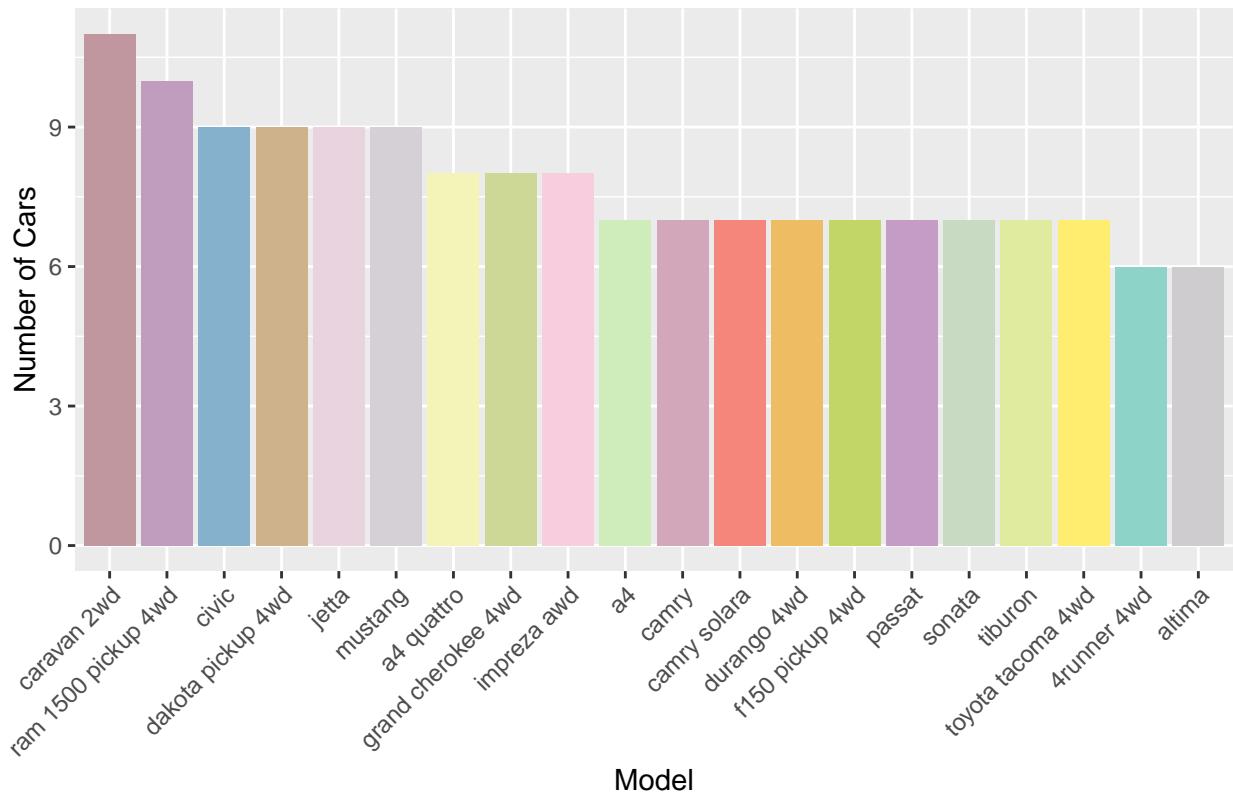
```

```

ggplot(top_20_models, aes(x = reorder(model, -count), y = count, fill = model)) +
  geom_bar(stat = "identity") +
  xlab("Model") +
  ylab("Number of Cars") +
  ggtitle("Top 20 Car Models by Number of Cars") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1), legend.position = "none") +
  scale_fill_manual(values = colorRampPalette(brewer.pal(12, "Set3"))(20))

```

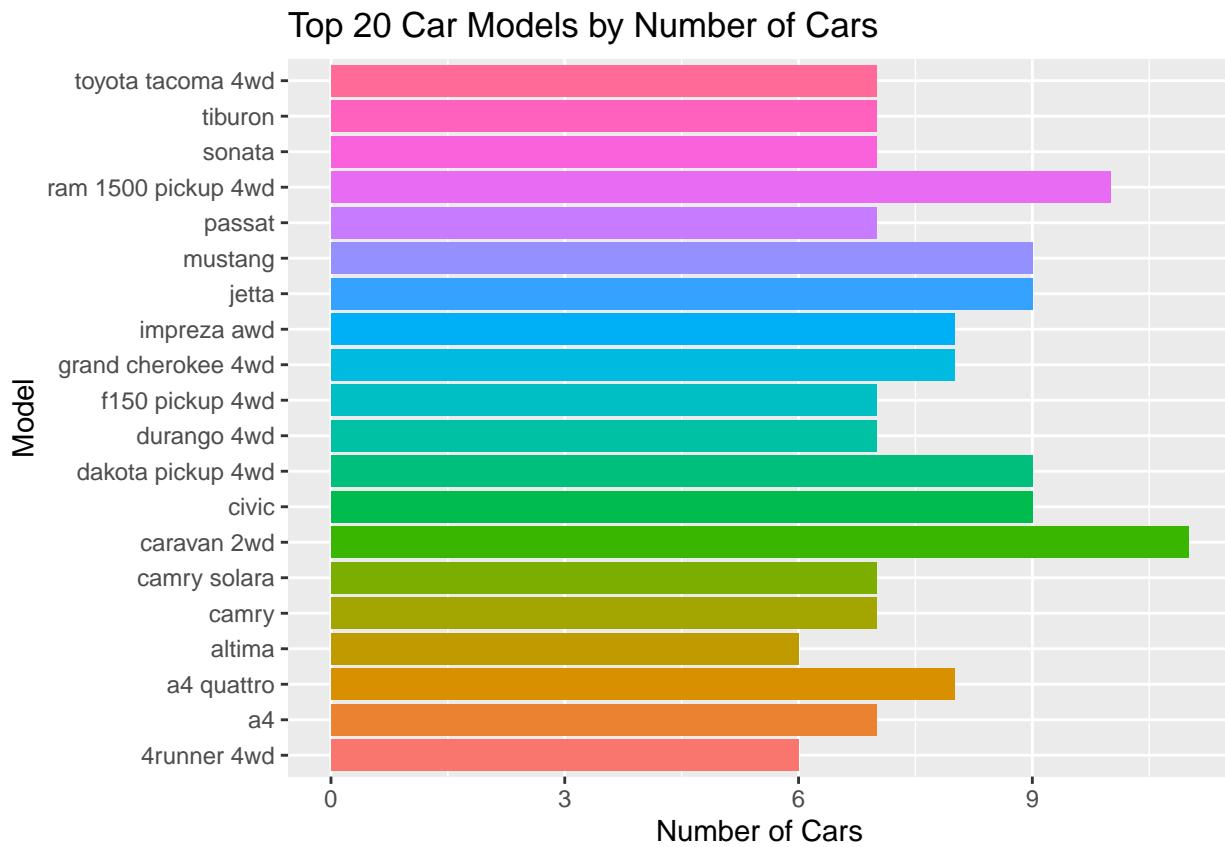
Top 20 Car Models by Number of Cars



```

ggplot(top_20_models, aes(x = model, y = count, fill = model)) +
  geom_bar(stat = "identity") +
  coord_flip() +
  xlab("Model") +
  ylab("Number of Cars") +
  ggtitle("Top 20 Car Models by Number of Cars") +
  theme(axis.text.y = element_text(size = 9), legend.position = "none")

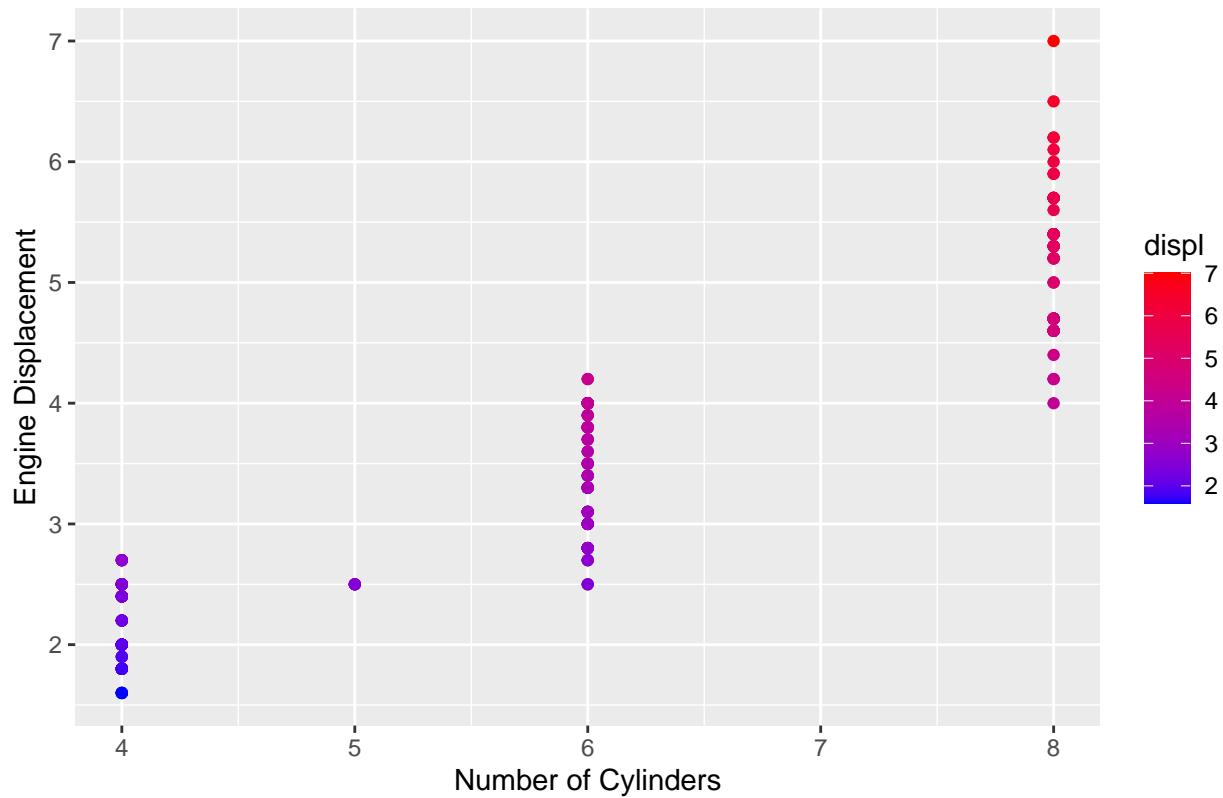
```



5. Cylinders vs Displacement

```
ggplot(mpg, aes(x = cyl, y = displ, color = displ)) +
  geom_point() +
  ggtitle("Relationship between No. of Cylinders and Engine Displacement") +
  xlab("Number of Cylinders") +
  ylab("Engine Displacement") +
  scale_color_gradient(low = "blue", high = "red")
```

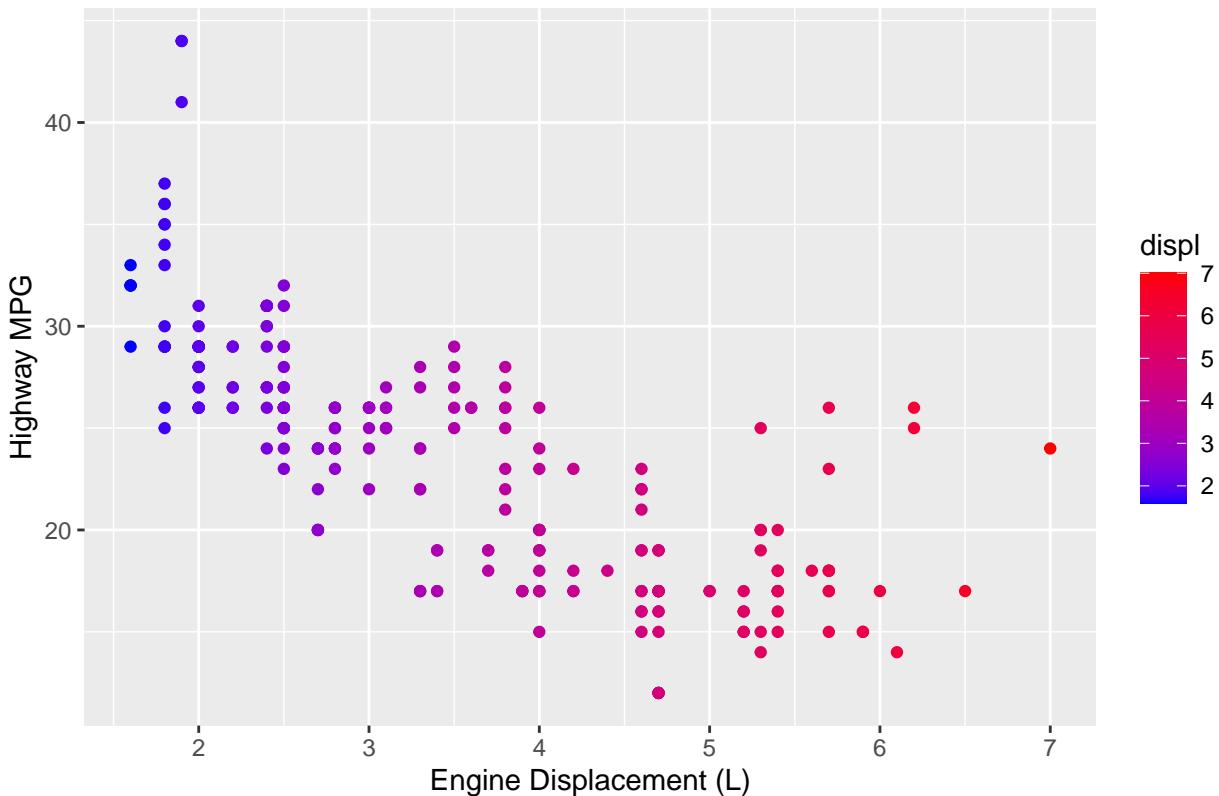
Relationship between No. of Cylinders and Engine Displacement



6. Displacement vs Highway MPG

```
ggplot(mpg, aes(x = displ, y = hwy, color = displ)) +  
  geom_point() +  
  ggtitle("Relationship between Engine Displacement and Highway MPG") +  
  xlab("Engine Displacement (L)") +  
  ylab("Highway MPG") +  
  scale_color_gradient(low = "blue", high = "red")
```

Relationship between Engine Displacement and Highway MPG



7. Traffic Data

```
traffic_data <- data.frame(
  Date = as.Date('2025-11-01') + 0:9,
  Location = rep(c("Intersection A", "Intersection B"), each = 5),
  Vehicles = c(120, 150, 130, 160, 140, 200, 210, 190, 205, 220),
  Average_Speed = c(35.5, 34.2, 36.0, 33.8, 34.5, 32.0, 31.5, 33.0, 30.8, 29.5)
)

write.csv(traffic_data, "traffic.csv", row.names = FALSE)
traffic <- read.csv("traffic.csv", stringsAsFactors = FALSE)

str(traffic)

## 'data.frame':   10 obs. of  4 variables:
## $ Date      : chr  "2025-11-01" "2025-11-02" "2025-11-03" "2025-11-04" ...
## $ Location   : chr  "Intersection A" "Intersection A" "Intersection A" "Intersection A" ...
## $ Vehicles   : int  120 150 130 160 140 200 210 190 205 220
## $ Average_Speed: num  35.5 34.2 36 33.8 34.5 32 31.5 33 30.8 29.5

intersection_a <- traffic[traffic$Location == "Intersection A", ]
intersection_b <- traffic[traffic$Location == "Intersection B", ]

print(intersection_a)

##          Date     Location Vehicles Average_Speed
## 1 2025-11-01 Intersection A      120        35.5
```

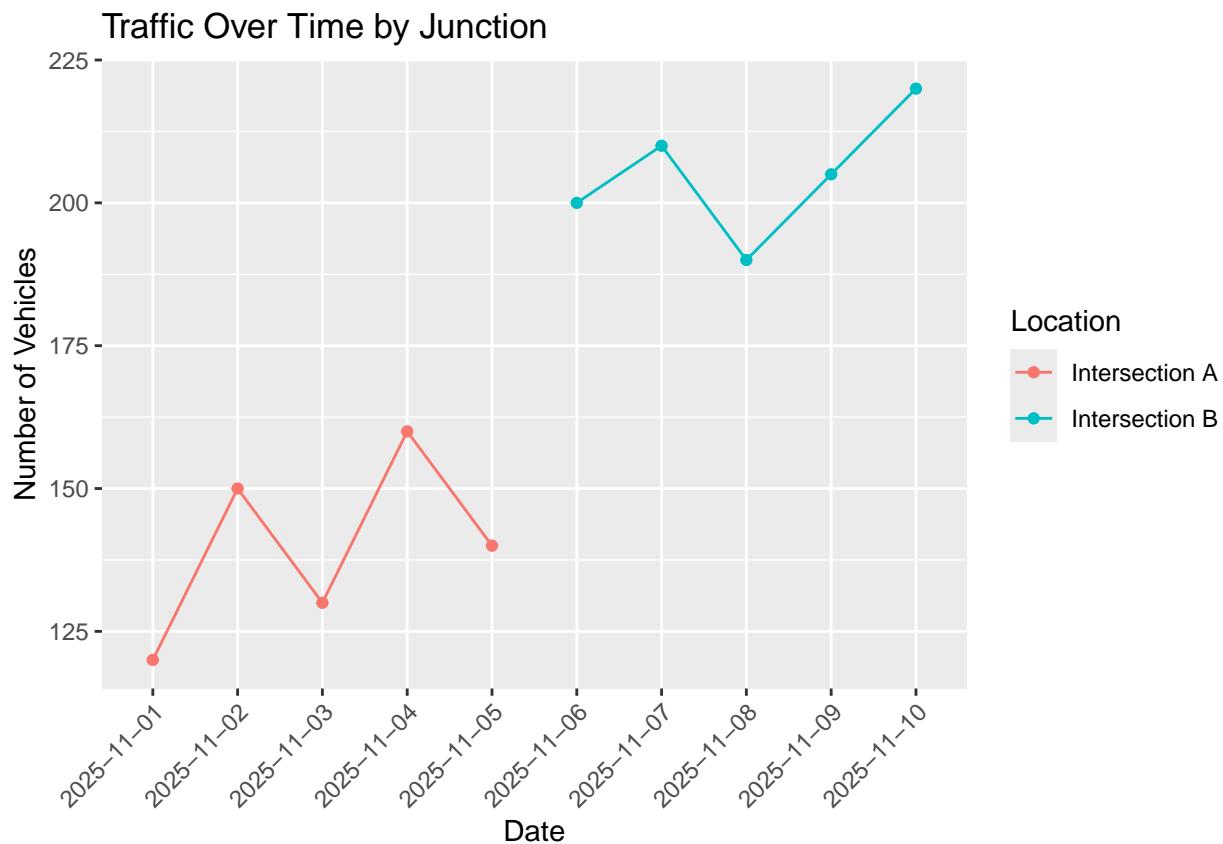
```

## 2 2025-11-02 Intersection A      150      34.2
## 3 2025-11-03 Intersection A      130      36.0
## 4 2025-11-04 Intersection A      160      33.8
## 5 2025-11-05 Intersection A      140      34.5
print(intersection_b)

##           Date      Location Vehicles Average_Speed
## 6 2025-11-06 Intersection B      200      32.0
## 7 2025-11-07 Intersection B      210      31.5
## 8 2025-11-08 Intersection B      190      33.0
## 9 2025-11-09 Intersection B      205      30.8
## 10 2025-11-10 Intersection B     220      29.5

ggplot(traffic, aes(x = Date, y = Vehicles, color = Location, group = Location)) +
  geom_line() +
  geom_point() +
  xlab("Date") +
  ylab("Number of Vehicles") +
  ggtitle("Traffic Over Time by Junction") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))

```



8. Alexa Dataset

```

alexa <- data.frame(
  rating = sample(1:5, 100, replace = TRUE),
  date = seq(as.Date("2024-01-01"), by = "day", length.out = 100),
  verified_reviews = sample(c("Great product", "Good", "Average", "Poor"), 100, replace = TRUE),

```

```

feedback = sample(0:1, 100, replace = TRUE),
variation = sample(c("Black", "White", "Charcoal Fabric", "Heather Gray Fabric"), 100, replace = TRUE)
)

write_xlsx(alexa, "alexa-file.xlsx")
alexa <- read_excel("alexa-file.xlsx")

str(alexa)

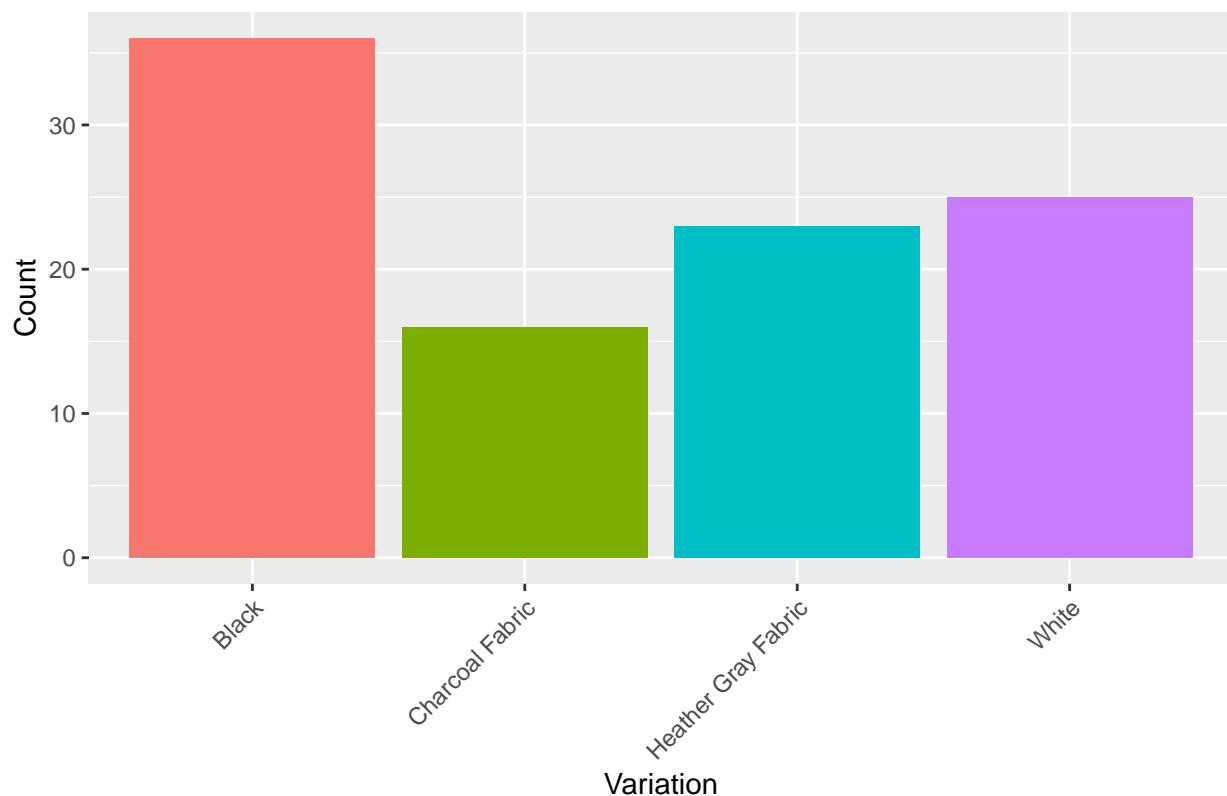
## # A tibble: [100 x 5] (S3:tbl_df/tbl/data.frame)
##   $ rating      : num [1:100] 3 3 1 1 4 2 1 1 2 4 ...
##   $ date        : POSIXct[1:100], format: "2024-01-01" "2024-01-02" ...
##   $ verified_reviews: chr [1:100] "Good" "Good" "Average" "Poor" ...
##   $ feedback     : num [1:100] 1 0 1 0 1 1 0 0 0 0 ...
##   $ variation    : chr [1:100] "Heather Gray Fabric" "Black" "Heather Gray Fabric" "Charcoal Fabric"
alexa %>%
  group_by(variation) %>%
  summarise(total = n())

## # A tibble: 4 x 2
##   variation     total
##   <chr>       <int>
## 1 Black          36
## 2 Charcoal Fabric 16
## 3 Heather Gray Fabric 23
## 4 White          25

ggplot(alexa, aes(x = variation, fill = variation)) +
  geom_bar() +
  xlab("Variation") +
  ylab("Count") +
  ggtitle("Count of Each Alexa Variation") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1), legend.position = "none")

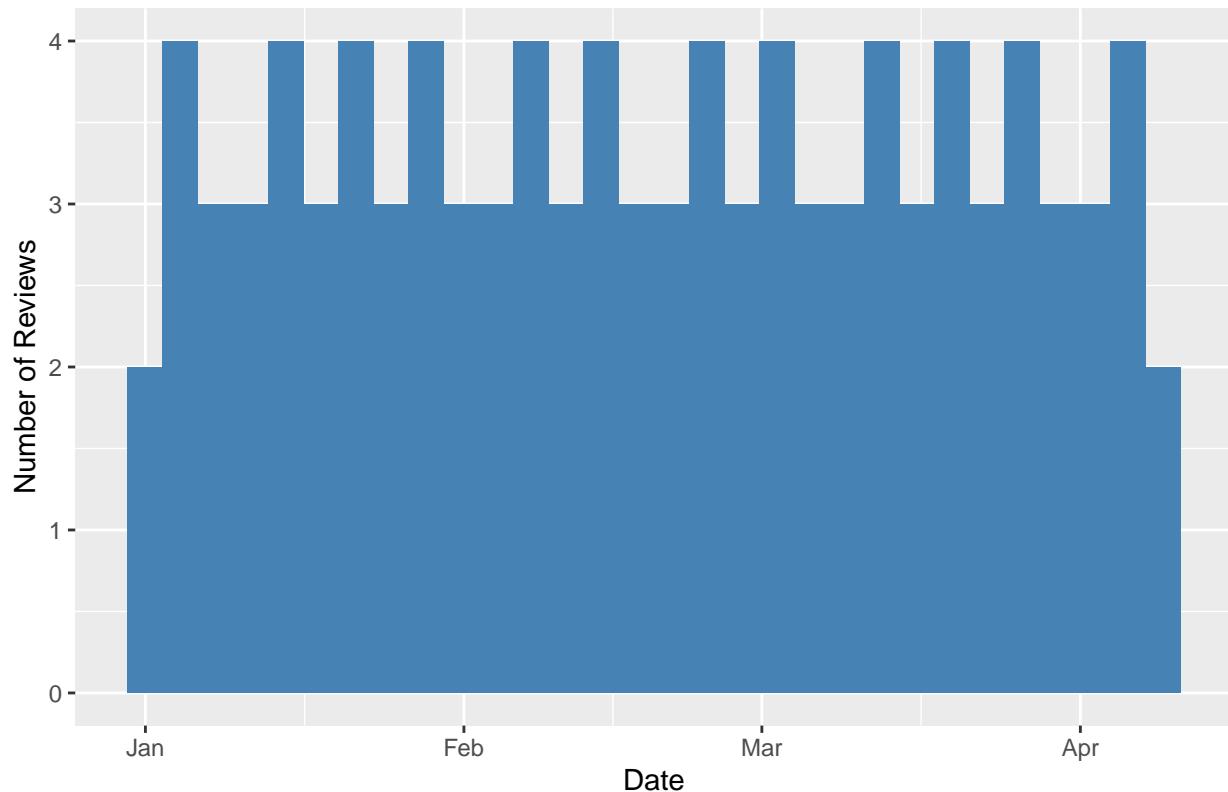
```

Count of Each Alexa Variation



```
ggplot(alexa, aes(x = date)) +  
  geom_histogram(bins = 30, fill = "steelblue") +  
  xlab("Date") +  
  ylab("Number of Reviews") +  
  ggtitle("Alexa Reviews Over Time")
```

Alexa Reviews Over Time



```
ggplot(alexa, aes(x = factor(rating), fill = factor(rating))) +  
  geom_bar() +  
  xlab("Rating") +  
  ylab("Count") +  
  ggtitle("Distribution of Alexa Ratings") +  
  scale_fill_brewer(palette = "Set3") +  
  theme(legend.position = "none")
```

Distribution of Alexa Ratings

