

RWorksheet_Aposaga#4c

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#1 #a

```
mpg <- read.csv("mpg.csv", header = TRUE, sep = ",")
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(14)	f	18
##	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
## 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						
##	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 #The categorical variables are the Manufacturer, Model, Trans, Drv, fl, and class.

#c #The continuous variables are displ, cty, hwy.

#2 #The manufacturer with the most models in the dataset is Toyota, having 6 different models. The “caravan 2wd” model has the most variations, with 11 different entries.

#a

```
# Load necessary libraries
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(ggplot2)
```

```
##
## Attaching package: 'ggplot2'
```

```
## The following object is masked _by_ '.GlobalEnv':
##
##      mpg
```

```
# Group by manufacturer and count unique models
mmc <- mpg %>%
  group_by(manufacturer) %>%
  summarise(unique_models = n_distinct(model)) %>%
  arrange(desc(unique_models))

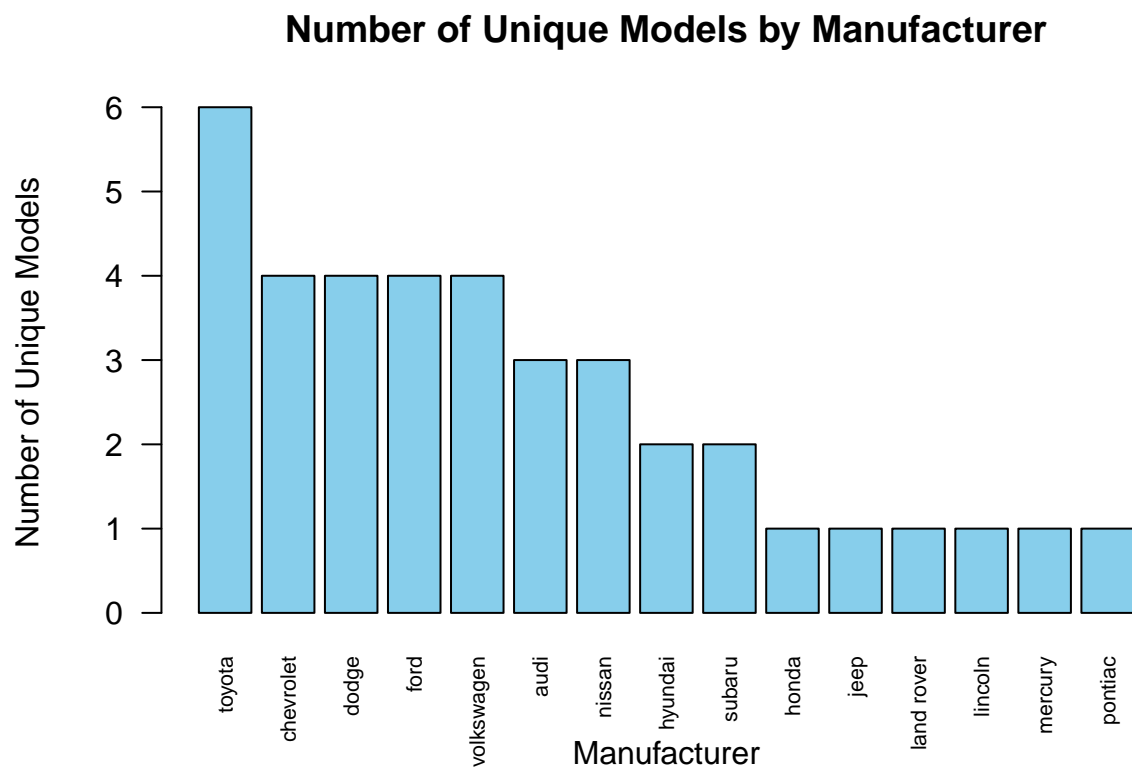
# Print the result
print(mmc)
```

```
## # A tibble: 15 x 2
##   manufacturer unique_models
##   <chr>          <int>
## 1 toyota             6
## 2 chevrolet          4
## 3 dodge             4
## 4 ford              4
## 5 volkswagen         4
```

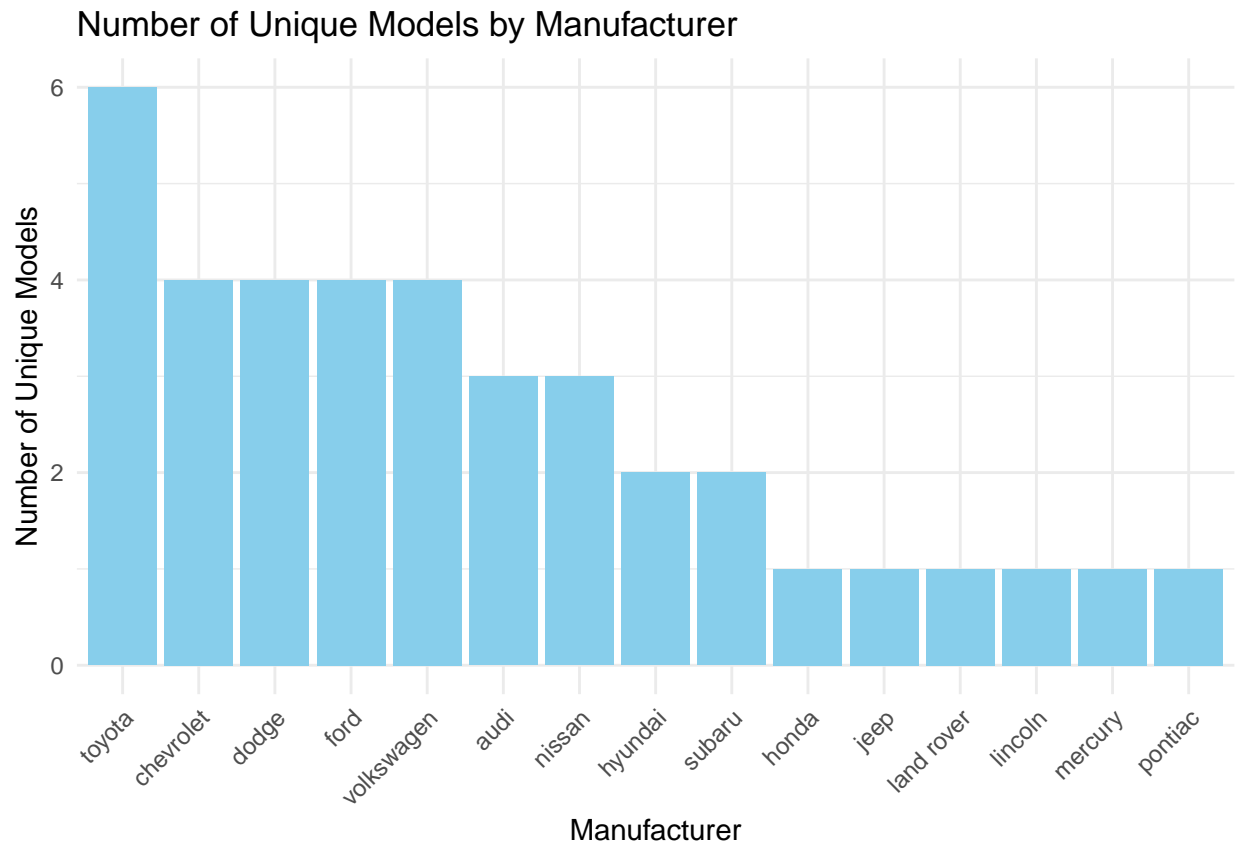
```
## 6 audi 3
## 7 nissan 3
## 8 hyundai 2
## 9 subaru 2
## 10 honda 1
## 11 jeep 1
## 12 land rover 1
## 13 lincoln 1
## 14 mercury 1
## 15 pontiac 1
```

```
#b
```

```
# Base R plotting
barplot(
  mmc$unique_models,
  names.arg = mmc$manufacturer,
  col = "skyblue",
  main = "Number of Unique Models by Manufacturer",
  xlab = "Manufacturer",
  ylab = "Number of Unique Models",
  las = 2,
  cex.names = 0.7
)
```

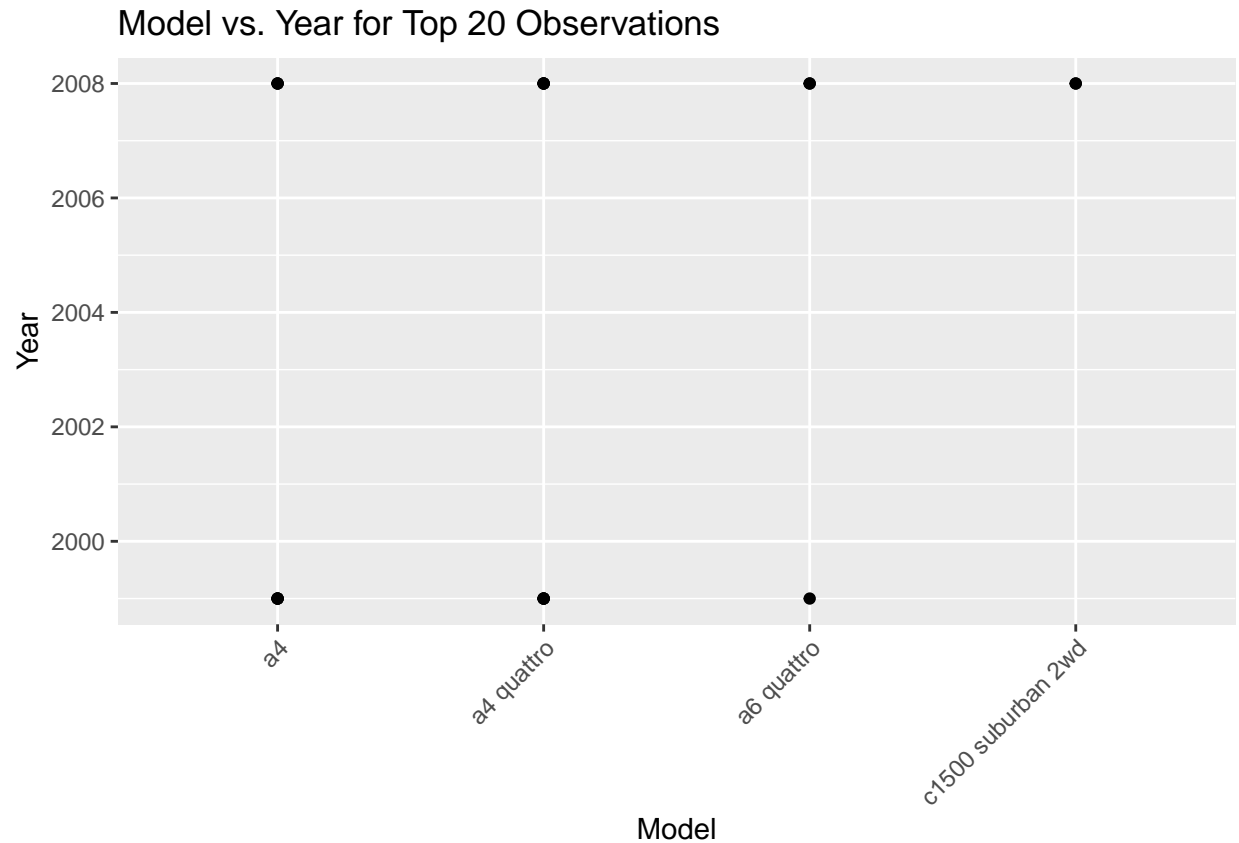


```
# ggplot2 plotting
ggplot(mmc, aes(x = reorder(manufacturer, -unique_models), y = unique_models)) +
  geom_bar(stat = "identity", fill = "skyblue") +
  labs(title = "Number of Unique Models by Manufacturer", x = "Manufacturer", y = "Number of Unique Models") +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```



#2a

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

#4

```
# Group by model and count the number of cars per model
model_counts <- mpg %>%
  group_by(model) %>%
  summarise(car_count = n())

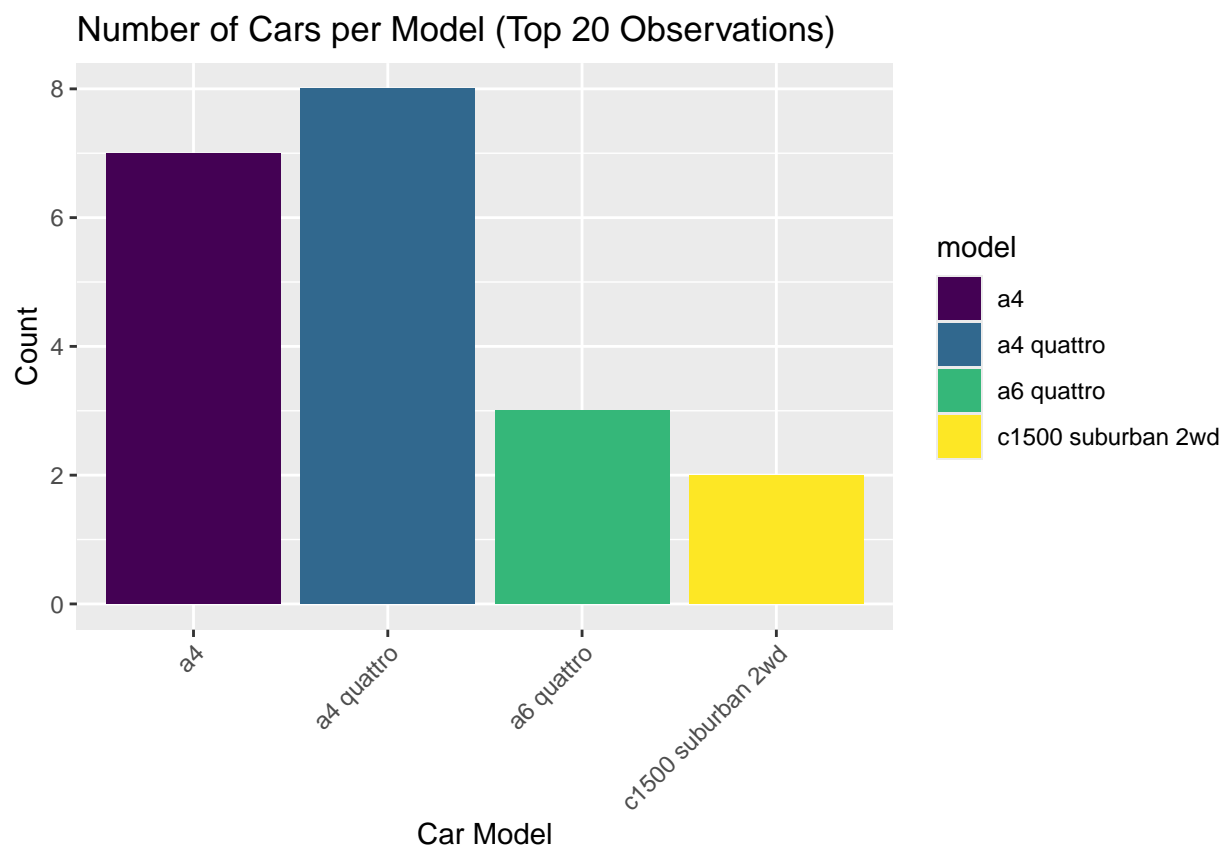
# View the result
model_counts
```

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

#4a

```
# Filter the top 20 observations
top_20 <- mpg %>%
  slice(1:20) # Select the first 20 rows

# Plot using ggplot with geom_bar()
ggplot(top_20, aes(x = model, fill = model)) +
  geom_bar() +
  labs(
    title = "Number of Cars per Model (Top 20 Observations)",
    x = "Car Model",
    y = "Count"
  ) +
  scale_fill_viridis_d() + # Adds color using a color scale
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

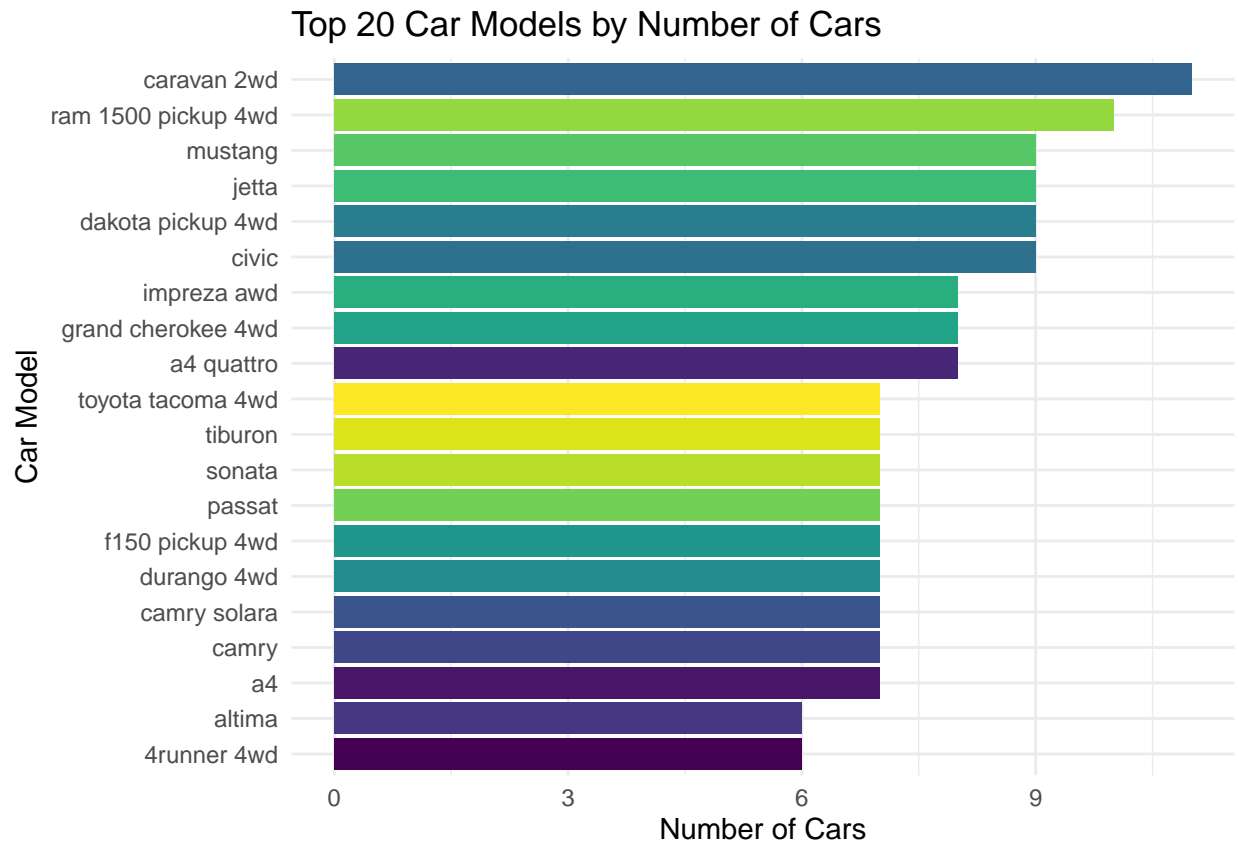


#4b

```
# Get the count of cars per model and select the top 20 observations
top_20_models <- mpg %>%
  group_by(model) %>%
  summarise(car_count = n()) %>%
  arrange(desc(car_count)) %>%
  slice(1:20)

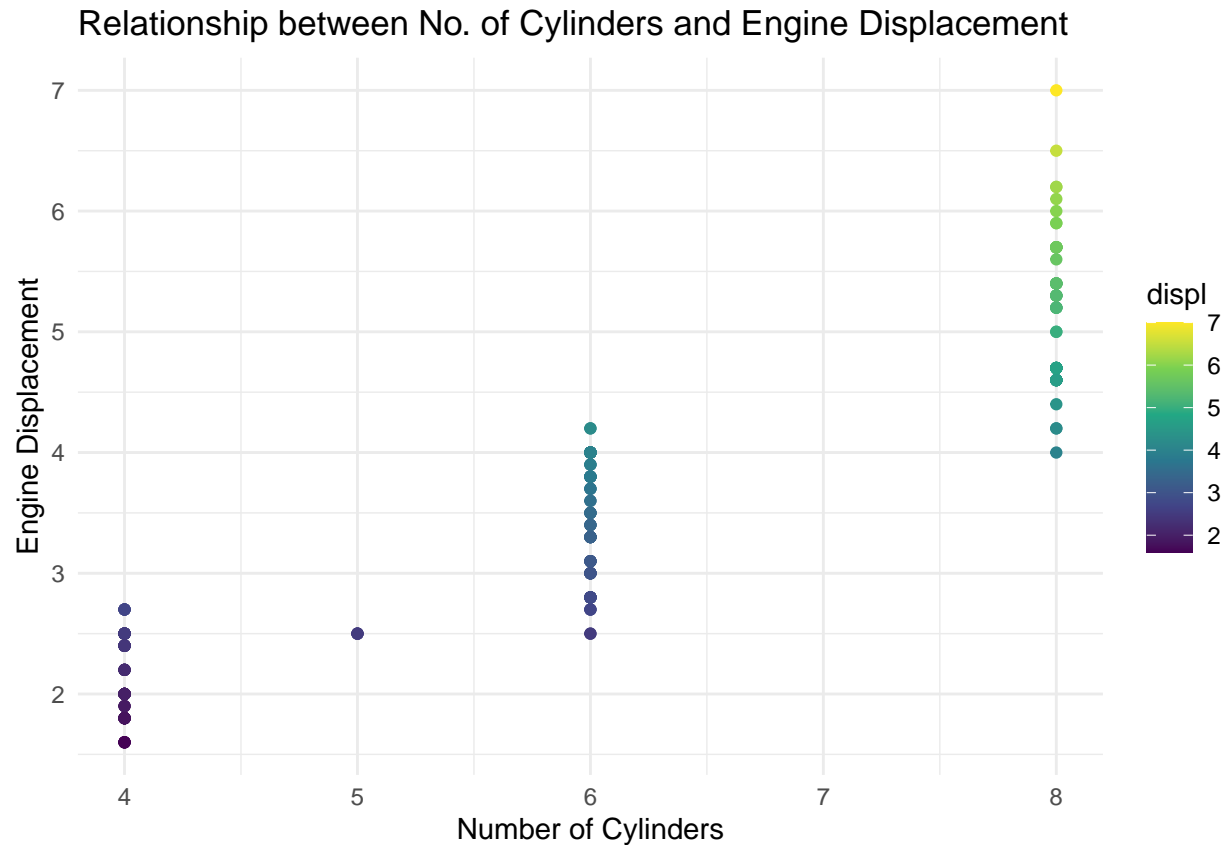
# Plot the top 20 models with a horizontal bar chart
ggplot(top_20_models, aes(x = reorder(model, car_count), y = car_count, fill = model)) +
```

```
geom_bar(stat = "identity", show.legend = FALSE) +
coord_flip() + # Flip coordinates for horizontal bars
labs(title = "Top 20 Car Models by Number of Cars",
      x = "Car Model",
      y = "Number of Cars") +
theme_minimal() +
scale_fill_viridis_d()
```



#5

```
# Create the scatter plot
ggplot(mpg, aes(x = cyl, y = displ, color = displ)) +
geom_point() +
labs(title = "Relationship between No. of Cylinders and Engine Displacement",
      x = "Number of Cylinders",
      y = "Engine Displacement") +
scale_color_viridis_c() + # Use a color scale for continuous variable (engine displacement)
theme_minimal()
```

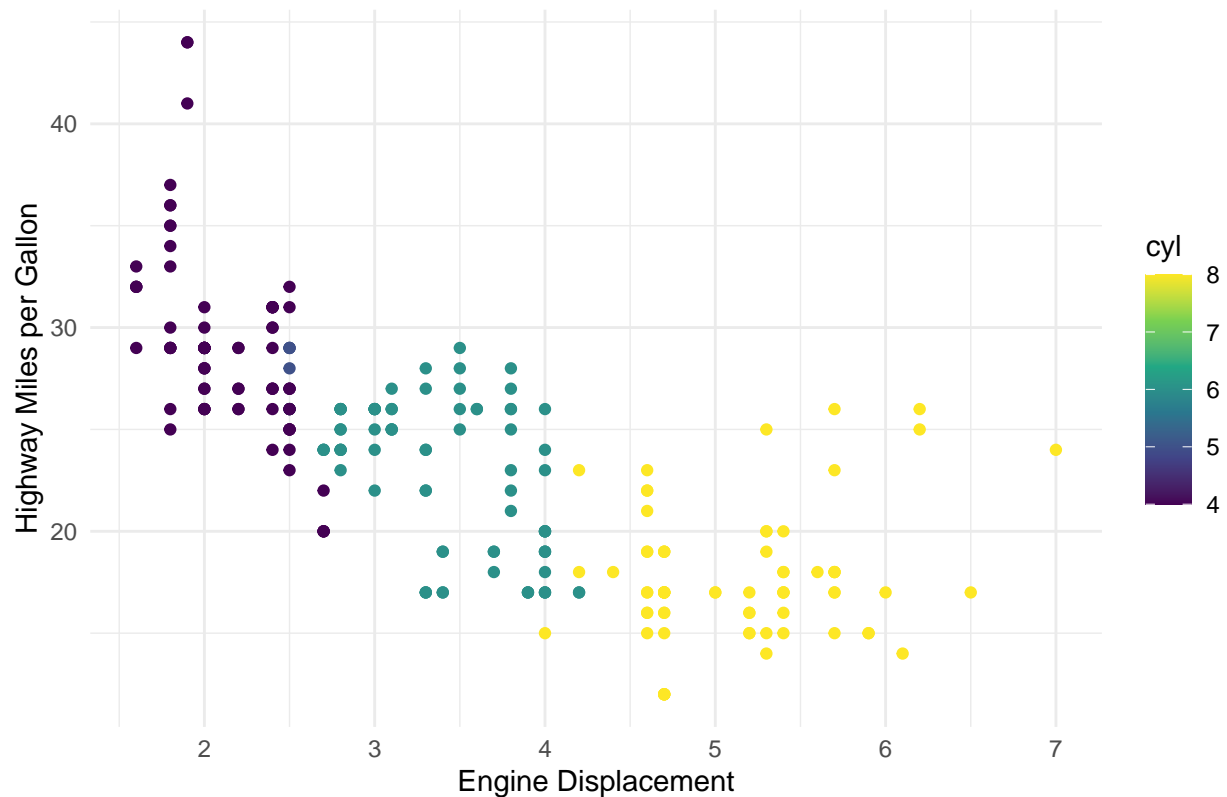



#5a #In the plot, as the number of cylinders (cyl) goes up, engine displacement (displ) generally increases too. This means cars with more cylinders tend to have bigger engines. The color intensity also shifts, reinforcing this trend: higher displacement values show up in colors tied to higher cylinder counts.

#6

```
ggplot(mpg, aes(x = displ, y = hwy, color = cyl)) +
  geom_point() +
  labs(title = "Relationship between Engine Displacement and Highway MPG",
        x = "Engine Displacement",
        y = "Highway Miles per Gallon") +
  scale_color_viridis_c() + # Use a color gradient for continuous variable (number of cylinders)
  theme_minimal()
```

Relationship between Engine Displacement and Highway MPG



#6

```
# Import the CSV file
traffic_data <- read.csv("traffic.csv")

# View the first few rows to confirm
head(traffic_data)
```

```
##           DateTime Junction Vehicles      ID
## 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
```

#6a

#The traffic dataset has 48,120 observations and 4 variables: DateTime, the date and time of each observation. Junction, the junction number. Vehicles, the number of vehicles counted. ID, a unique identifier for each observation.

#6b

```
# Subset data by each unique junction
junction_1 <- subset(traffic_data, Junction == 1)
```

```

junction_2 <- subset(traffic_data, Junction == 2)
junction_3 <- subset(traffic_data, Junction == 3)
junction_4 <- subset(traffic_data, Junction == 4)

# Display the first few rows of each subset to confirm
head(junction_1)

```

```

##           DateTime Junction Vehicles          ID
## 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

```

```
head(junction_2)
```

```

##           DateTime Junction Vehicles          ID
## 14593 2015-11-01 00:00:00         2         6 20151101002
## 14594 2015-11-01 01:00:00         2         6 20151101012
## 14595 2015-11-01 02:00:00         2         5 20151101022
## 14596 2015-11-01 03:00:00         2         6 20151101032
## 14597 2015-11-01 04:00:00         2         7 20151101042
## 14598 2015-11-01 05:00:00         2         2 20151101052

```

```
head(junction_3)
```

```

##           DateTime Junction Vehicles          ID
## 29185 2015-11-01 00:00:00         3         9 20151101003
## 29186 2015-11-01 01:00:00         3         7 20151101013
## 29187 2015-11-01 02:00:00         3         5 20151101023
## 29188 2015-11-01 03:00:00         3         1 20151101033
## 29189 2015-11-01 04:00:00         3         2 20151101043
## 29190 2015-11-01 05:00:00         3         2 20151101053

```

```
head(junction_4)
```

```

##           DateTime Junction Vehicles          ID
## 43777 2017-01-01 00:00:00         4         3 20170101004
## 43778 2017-01-01 01:00:00         4         1 20170101014
## 43779 2017-01-01 02:00:00         4         4 20170101024
## 43780 2017-01-01 03:00:00         4         4 20170101034
## 43781 2017-01-01 04:00:00         4         2 20170101044
## 43782 2017-01-01 05:00:00         4         1 20170101054

```

```
#6c
```

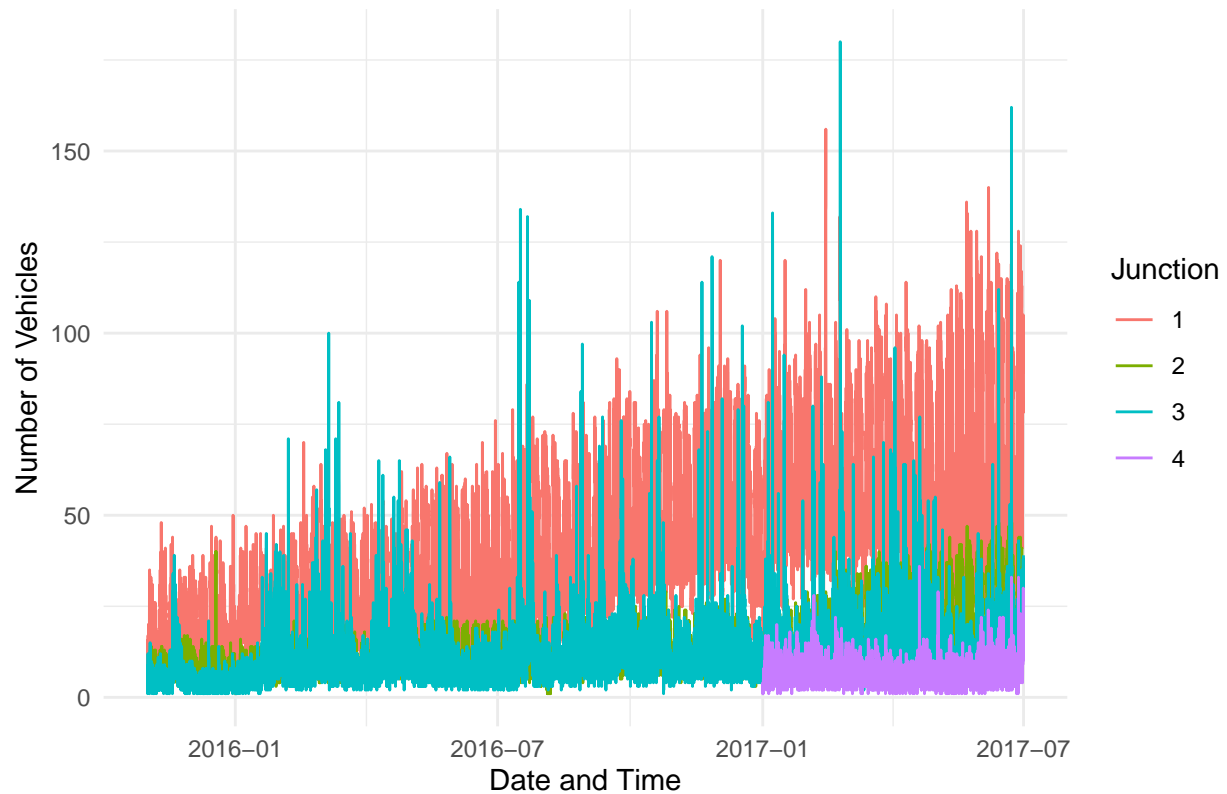
```

# Convert DateTime to date-time format in R if not already
traffic_data$DateTime <- as.POSIXct(traffic_data$DateTime, format="%Y-%m-%d %H:%M:%S")

```

```
# Plotting each junction's data
ggplot(traffic_data, aes(x = DateTime, y = Vehicles, color = factor(Junction))) +
  geom_line() +
  labs(title = "Traffic Volume at Each Junction Over Time",
       x = "Date and Time",
       y = "Number of Vehicles",
       color = "Junction") +
  theme_minimal()
```

Traffic Volume at Each Junction Over Time



#7

```
library(readxl)

# Read the Excel file
alexaExcel <- read_excel("alexa_file.xlsx")
```

#7a

```
# Get the number of observations (rows) and columns
num_observations <- nrow(alexaExcel)
num_columns <- ncol(alexaExcel)

# Display the number of observations (rows) and columns clearly
cat("Number of observations:", nrow(alexaExcel), "\n")
```

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

```
cat("Number of columns:", ncol(alexaExcel), "\n")
```

```
## Number of columns: 5
```

```
#7b
```

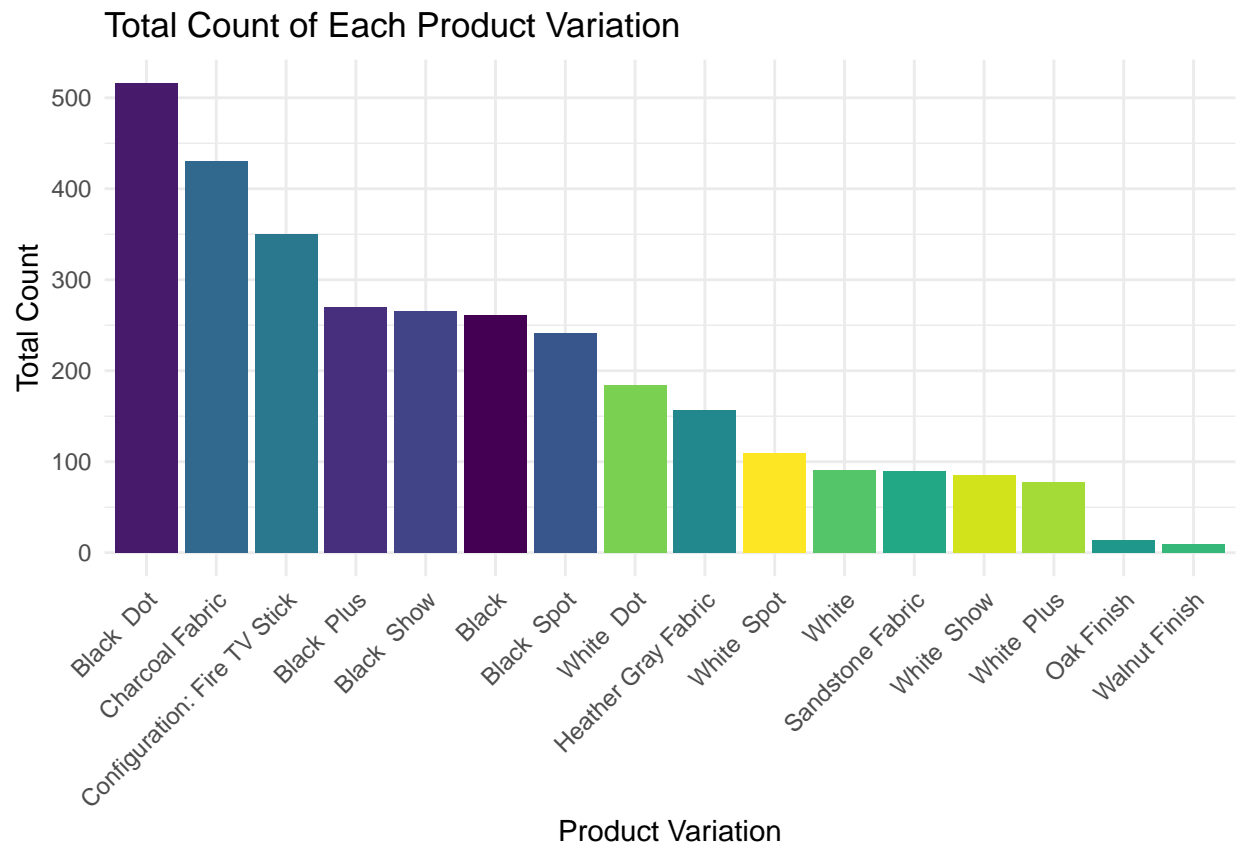
```
# Group by variation and get the count for each variation
variation_counts <- alexaExcel %>%
  group_by(variation) %>%
  summarise(total_count = n())

# Display the result
variation_counts
```

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

```
#7c
```

```
# Plot the variations
ggplot(variation_counts, aes(x = reorder(variation, -total_count), y = total_count, fill = variation)) +
  geom_bar(stat = "identity", show.legend = FALSE) +
  labs(title = "Total Count of Each Product Variation",
       x = "Product Variation",
       y = "Total Count") +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
  scale_fill_viridis_d()
```

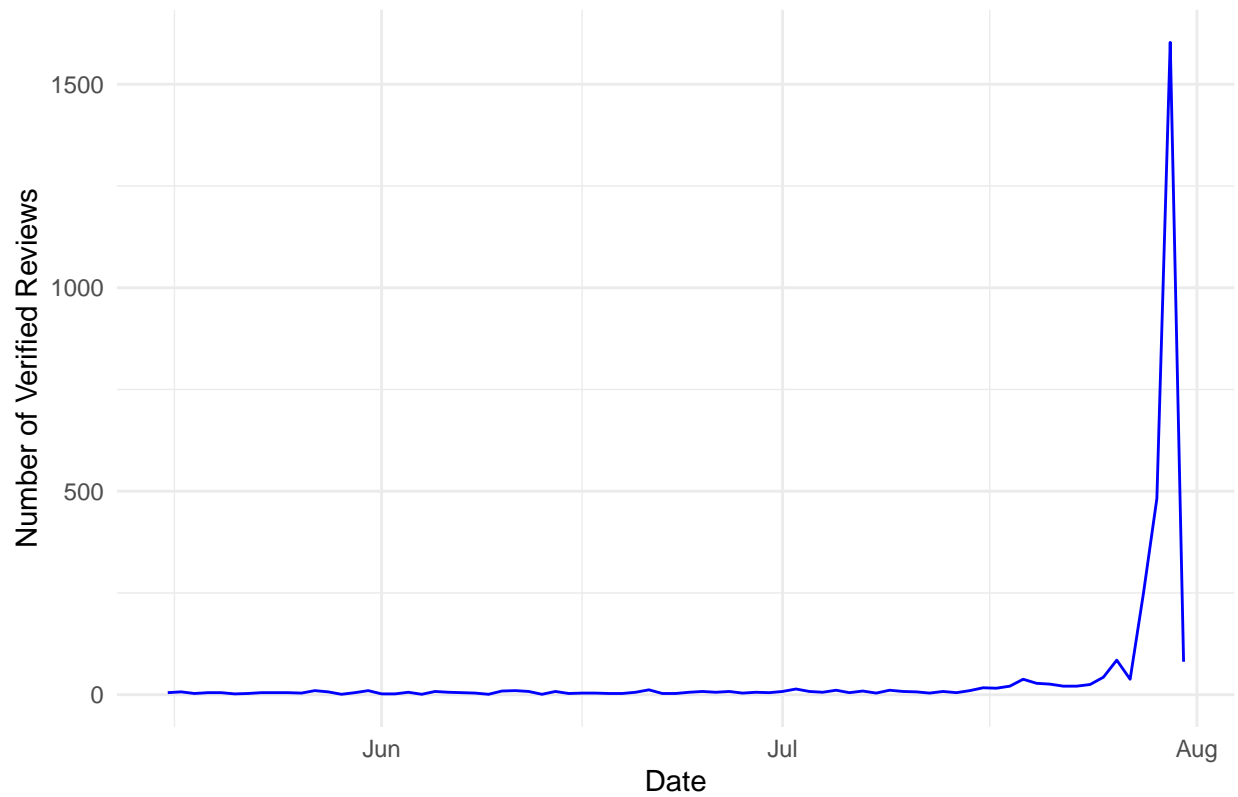


#7d

```
# Prepare data by counting verified reviews per date
reviews_per_date <- alexaExcel %>%
  group_by(date) %>%
  summarise(num_reviews = n())

# Plot the time series of reviews
ggplot(reviews_per_date, aes(x = date, y = num_reviews)) +
  geom_line(color = "blue") +
  labs(title = "Number of Verified Reviews Over Time",
       x = "Date",
       y = "Number of Verified Reviews") +
  theme_minimal()
```

Number of Verified Reviews Over Time



#7e

```
# Calculate average rating for each variation
variation_ratings <- alexaExcel %>%
  group_by(variation) %>%
  summarise(average_rating = mean(rating))

# Plot the average rating for each variation
ggplot(variation_ratings, aes(x = reorder(variation, -average_rating), y = average_rating, fill = variation_ratings$variation)) +
  geom_bar(stat = "identity", show.legend = FALSE) +
  labs(title = "Average Rating by Product Variation",
       x = "Product Variation",
       y = "Average Rating") +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
  scale_fill_viridis_d()
```

