

# RWorksheet\_Obas#4c

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

```
mpg <- read.csv(file= "mpg.csv")
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(l4)	r	11	15
## 21	chevrolet	c1500 suburban 2wd	5.3	2008	8	auto(l4)	r	14	20
## 22	chevrolet	c1500 suburban 2wd	5.7	1999	8	auto(l4)	r	13	17
## 23	chevrolet	c1500 suburban 2wd	6.0	2008	8	auto(l4)	r	12	17
## 24	chevrolet	corvette	5.7	1999	8	manual(m6)	r	16	26
## 25	chevrolet	corvette	5.7	1999	8	auto(l4)	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(l4)	4	14	19
## 30	chevrolet	k1500 tahoe 4wd	5.3	2008	8	auto(l4)	4	11	14
## 31	chevrolet	k1500 tahoe 4wd	5.7	1999	8	auto(l4)	4	11	15
## 32	chevrolet	k1500 tahoe 4wd	6.5	1999	8	auto(l4)	4	14	17
## 33	chevrolet	malibu	2.4	1999	4	auto(l4)	f	19	27
## 34	chevrolet	malibu	2.4	2008	4	auto(l4)	f	22	30
## 35	chevrolet	malibu	3.1	1999	6	auto(l4)	f	18	26
## 36	chevrolet	malibu	3.5	2008	6	auto(l4)	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)	4	15	19
## 50	dodge	dakota pickup 4wd	3.7	2008	6	auto(14)	4	14	18
## 51	dodge	dakota pickup 4wd	3.9	1999	6	auto(14)	4	13	17
## 52	dodge	dakota pickup 4wd	3.9	1999	6	manual(m5)	4	14	17
## 53	dodge	dakota pickup 4wd	4.7	2008	8	auto(15)	4	14	19
## 54	dodge	dakota pickup 4wd	4.7	2008	8	auto(15)	4	14	19
## 55	dodge	dakota pickup 4wd	4.7	2008	8	auto(15)	4	9	12
## 56	dodge	dakota pickup 4wd	5.2	1999	8	manual(m5)	4	11	17
## 57	dodge	dakota pickup 4wd	5.2	1999	8	auto(14)	4	11	15
## 58	dodge	durango 4wd	3.9	1999	6	auto(14)	4	13	17
## 59	dodge	durango 4wd	4.7	2008	8	auto(15)	4	13	17
## 60	dodge	durango 4wd	4.7	2008	8	auto(15)	4	9	12
## 61	dodge	durango 4wd	4.7	2008	8	auto(15)	4	13	17
## 62	dodge	durango 4wd	5.2	1999	8	auto(14)	4	11	16
## 63	dodge	durango 4wd	5.7	2008	8	auto(15)	4	13	18
## 64	dodge	durango 4wd	5.9	1999	8	auto(14)	4	11	15
## 65	dodge	ram 1500 pickup 4wd	4.7	2008	8	manual(m6)	4	12	16
## 66	dodge	ram 1500 pickup 4wd	4.7	2008	8	auto(15)	4	9	12
## 67	dodge	ram 1500 pickup 4wd	4.7	2008	8	auto(15)	4	13	17
## 68	dodge	ram 1500 pickup 4wd	4.7	2008	8	auto(15)	4	13	17
## 69	dodge	ram 1500 pickup 4wd	4.7	2008	8	manual(m6)	4	12	16
## 70	dodge	ram 1500 pickup 4wd	4.7	2008	8	manual(m6)	4	9	12
## 71	dodge	ram 1500 pickup 4wd	5.2	1999	8	auto(14)	4	11	15
## 72	dodge	ram 1500 pickup 4wd	5.2	1999	8	manual(m5)	4	11	16
## 73	dodge	ram 1500 pickup 4wd	5.7	2008	8	auto(15)	4	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(l4)	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(l4)	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(l5)	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(l4)	f	18	26
## 156	pontiac	grand prix	3.8	1999	6	auto(l4)	f	16	26
## 157	pontiac	grand prix	3.8	1999	6	auto(l4)	f	17	27
## 158	pontiac	grand prix	3.8	2008	6	auto(l4)	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(l4)	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(l4)	4	20	26
## 165	subaru	forester awd	2.5	2008	4	auto(l4)	4	18	23
## 166	subaru	impreza awd	2.2	1999	4	auto(l4)	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(l4)	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(l4)	4	16	20
## 176	toyota	4runner 4wd	3.4	1999	6	auto(l4)	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(l5)	4	16	20
## 179	toyota	4runner 4wd	4.7	2008	8	auto(l5)	4	14	17
## 180	toyota	camry	2.2	1999	4	manual(m5)	f	21	29
## 181	toyota	camry	2.2	1999	4	auto(l4)	f	21	27
## 182	toyota	camry	2.4	2008	4	manual(m5)	f	21	31
## 183	toyota	camry	2.4	2008	4	auto(l5)	f	21	31
## 184	toyota	camry	3.0	1999	6	auto(l4)	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(l4)	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(l4)	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(l3)	f	24	30
## 195	toyota	corolla	1.8	1999	4	auto(l4)	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(l4)	f	26	35
## 199	toyota	land cruiser wagon 4wd	4.7	1999	8	auto(l4)	4	11	15

## 200	toyota	land cruiser wagon 4wd	5.7	2008	8	auto(s6)	4	13	18
## 201	toyota	toyota tacoma 4wd	2.7	1999	4	manual(m5)	4	15	20
## 202	toyota	toyota tacoma 4wd	2.7	1999	4	auto(l4)	4	16	20
## 203	toyota	toyota tacoma 4wd	2.7	2008	4	manual(m5)	4	17	22
## 204	toyota	toyota tacoma 4wd	3.4	1999	6	manual(m5)	4	15	17
## 205	toyota	toyota tacoma 4wd	3.4	1999	6	auto(l4)	4	15	19
## 206	toyota	toyota tacoma 4wd	4.0	2008	6	manual(m6)	4	15	18
## 207	toyota	toyota tacoma 4wd	4.0	2008	6	auto(l5)	4	16	20
## 208	volkswagen	gti	2.0	1999	4	manual(m5)	f	21	29
## 209	volkswagen	gti	2.0	1999	4	auto(l4)	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(l4)	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(l4)	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(l4)	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(l4)	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(l5)	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(l5)	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
##	fl	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

```

#1.b Which variables from mpg dataset are categorical?

```
mpg_Var <- names(sapply(mpg, function(x) is.factor(x) || is.character(x)))
mpg_Var
```

```
## [1] "manufacturer" "model"      "displ"      "year"      "cyl"
## [6] "trans"        "drv"        "cty"        "hwy"      "fl"
## [11] "class"
```

*# The variables from mpg dataset are categorical are manufacturer, model, displ, year, cyl, trans, drv, cty, hwy, fl, class*

#1.c Which are continuous variables?

```
continous <- sapply(mpg, is.numeric)
cont_vars <- names(mpg)[continous]
cont_vars
```

```
## [1] "displ" "year"  "cyl"   "cty"   "hwy"
```

*# The continuous variables are displ, year, cyl, cty, and hwy*

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

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
## The following objects are masked from 'package:stats':
##
##   filter, lag
## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union
```

```
mostmodels_man <- mpg %>%
  group_by(manufacturer) %>%
  summarise(num_models = n_distinct(model)) %>%
  arrange(desc(num_models)) %>%
  head(1)
```

```
mostmodels_var <- mpg %>%
  group_by(model) %>%
  summarise(num_var = n()) %>%
  arrange(desc(num_var)) %>%
  head(1)
```

```
cat("Manufacturer with the most models:", mostmodels_man $manufacturer, "\n")
```

```
## Manufacturer with the most models: toyota
```

```
cat("Model with the most variations:", mostmodels_var$model, "\n")
```

```
## Model with the most variations: caravan 2wd
```

```
#Manufacturer with the most models is toyota  
#Model with the most variations is caravan 2wd
```

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

```
library(dplyr)
```

```
manufacturersModels <- data.frame(Manufacturer = mpg$manufacturer, Model = mpg$model)  
manufacturersModels
```

##	Manufacturer	Model
## 1	audi	a4
## 2	audi	a4
## 3	audi	a4
## 4	audi	a4
## 5	audi	a4
## 6	audi	a4
## 7	audi	a4
## 8	audi	a4 quattro
## 9	audi	a4 quattro
## 10	audi	a4 quattro
## 11	audi	a4 quattro
## 12	audi	a4 quattro
## 13	audi	a4 quattro
## 14	audi	a4 quattro
## 15	audi	a4 quattro
## 16	audi	a6 quattro
## 17	audi	a6 quattro
## 18	audi	a6 quattro
## 19	chevrolet	c1500 suburban 2wd
## 20	chevrolet	c1500 suburban 2wd
## 21	chevrolet	c1500 suburban 2wd
## 22	chevrolet	c1500 suburban 2wd
## 23	chevrolet	c1500 suburban 2wd
## 24	chevrolet	corvette
## 25	chevrolet	corvette
## 26	chevrolet	corvette
## 27	chevrolet	corvette
## 28	chevrolet	corvette
## 29	chevrolet	k1500 tahoe 4wd
## 30	chevrolet	k1500 tahoe 4wd
## 31	chevrolet	k1500 tahoe 4wd
## 32	chevrolet	k1500 tahoe 4wd
## 33	chevrolet	malibu
## 34	chevrolet	malibu
## 35	chevrolet	malibu
## 36	chevrolet	malibu
## 37	chevrolet	malibu
## 38	dodge	caravan 2wd
## 39	dodge	caravan 2wd
## 40	dodge	caravan 2wd
## 41	dodge	caravan 2wd
## 42	dodge	caravan 2wd
## 43	dodge	caravan 2wd
## 44	dodge	caravan 2wd

## 45	dodge	caravan	2wd
## 46	dodge	caravan	2wd
## 47	dodge	caravan	2wd
## 48	dodge	caravan	2wd
## 49	dodge	dakota pickup	4wd
## 50	dodge	dakota pickup	4wd
## 51	dodge	dakota pickup	4wd
## 52	dodge	dakota pickup	4wd
## 53	dodge	dakota pickup	4wd
## 54	dodge	dakota pickup	4wd
## 55	dodge	dakota pickup	4wd
## 56	dodge	dakota pickup	4wd
## 57	dodge	dakota pickup	4wd
## 58	dodge	durango	4wd
## 59	dodge	durango	4wd
## 60	dodge	durango	4wd
## 61	dodge	durango	4wd
## 62	dodge	durango	4wd
## 63	dodge	durango	4wd
## 64	dodge	durango	4wd
## 65	dodge	ram 1500 pickup	4wd
## 66	dodge	ram 1500 pickup	4wd
## 67	dodge	ram 1500 pickup	4wd
## 68	dodge	ram 1500 pickup	4wd
## 69	dodge	ram 1500 pickup	4wd
## 70	dodge	ram 1500 pickup	4wd
## 71	dodge	ram 1500 pickup	4wd
## 72	dodge	ram 1500 pickup	4wd
## 73	dodge	ram 1500 pickup	4wd
## 74	dodge	ram 1500 pickup	4wd
## 75	ford	expedition	2wd
## 76	ford	expedition	2wd
## 77	ford	expedition	2wd
## 78	ford	explorer	4wd
## 79	ford	explorer	4wd
## 80	ford	explorer	4wd
## 81	ford	explorer	4wd
## 82	ford	explorer	4wd
## 83	ford	explorer	4wd
## 84	ford	f150 pickup	4wd
## 85	ford	f150 pickup	4wd
## 86	ford	f150 pickup	4wd
## 87	ford	f150 pickup	4wd
## 88	ford	f150 pickup	4wd
## 89	ford	f150 pickup	4wd
## 90	ford	f150 pickup	4wd
## 91	ford	mustang	
## 92	ford	mustang	
## 93	ford	mustang	
## 94	ford	mustang	
## 95	ford	mustang	
## 96	ford	mustang	
## 97	ford	mustang	
## 98	ford	mustang	

## 99	ford	mustang
## 100	honda	civic
## 101	honda	civic
## 102	honda	civic
## 103	honda	civic
## 104	honda	civic
## 105	honda	civic
## 106	honda	civic
## 107	honda	civic
## 108	honda	civic
## 109	hyundai	sonata
## 110	hyundai	sonata
## 111	hyundai	sonata
## 112	hyundai	sonata
## 113	hyundai	sonata
## 114	hyundai	sonata
## 115	hyundai	sonata
## 116	hyundai	tiburon
## 117	hyundai	tiburon
## 118	hyundai	tiburon
## 119	hyundai	tiburon
## 120	hyundai	tiburon
## 121	hyundai	tiburon
## 122	hyundai	tiburon
## 123	jeep	grand cherokee 4wd
## 124	jeep	grand cherokee 4wd
## 125	jeep	grand cherokee 4wd
## 126	jeep	grand cherokee 4wd
## 127	jeep	grand cherokee 4wd
## 128	jeep	grand cherokee 4wd
## 129	jeep	grand cherokee 4wd
## 130	jeep	grand cherokee 4wd
## 131	land rover	range rover
## 132	land rover	range rover
## 133	land rover	range rover
## 134	land rover	range rover
## 135	lincoln	navigator 2wd
## 136	lincoln	navigator 2wd
## 137	lincoln	navigator 2wd
## 138	mercury	mountaineer 4wd
## 139	mercury	mountaineer 4wd
## 140	mercury	mountaineer 4wd
## 141	mercury	mountaineer 4wd
## 142	nissan	altima
## 143	nissan	altima
## 144	nissan	altima
## 145	nissan	altima
## 146	nissan	altima
## 147	nissan	altima
## 148	nissan	maxima
## 149	nissan	maxima
## 150	nissan	maxima
## 151	nissan	pathfinder 4wd
## 152	nissan	pathfinder 4wd

## 153	nissan	pathfinder 4wd
## 154	nissan	pathfinder 4wd
## 155	pontiac	grand prix
## 156	pontiac	grand prix
## 157	pontiac	grand prix
## 158	pontiac	grand prix
## 159	pontiac	grand prix
## 160	subaru	forester awd
## 161	subaru	forester awd
## 162	subaru	forester awd
## 163	subaru	forester awd
## 164	subaru	forester awd
## 165	subaru	forester awd
## 166	subaru	impreza awd
## 167	subaru	impreza awd
## 168	subaru	impreza awd
## 169	subaru	impreza awd
## 170	subaru	impreza awd
## 171	subaru	impreza awd
## 172	subaru	impreza awd
## 173	subaru	impreza awd
## 174	toyota	4runner 4wd
## 175	toyota	4runner 4wd
## 176	toyota	4runner 4wd
## 177	toyota	4runner 4wd
## 178	toyota	4runner 4wd
## 179	toyota	4runner 4wd
## 180	toyota	camry
## 181	toyota	camry
## 182	toyota	camry
## 183	toyota	camry
## 184	toyota	camry
## 185	toyota	camry
## 186	toyota	camry
## 187	toyota	camry solara
## 188	toyota	camry solara
## 189	toyota	camry solara
## 190	toyota	camry solara
## 191	toyota	camry solara
## 192	toyota	camry solara
## 193	toyota	camry solara
## 194	toyota	corolla
## 195	toyota	corolla
## 196	toyota	corolla
## 197	toyota	corolla
## 198	toyota	corolla
## 199	toyota land	cruiser wagon 4wd
## 200	toyota land	cruiser wagon 4wd
## 201	toyota	toyota tacoma 4wd
## 202	toyota	toyota tacoma 4wd
## 203	toyota	toyota tacoma 4wd
## 204	toyota	toyota tacoma 4wd
## 205	toyota	toyota tacoma 4wd
## 206	toyota	toyota tacoma 4wd

```
## 207      toyota      toyota tacoma 4wd
## 208 volkswagen      gti
## 209 volkswagen      gti
## 210 volkswagen      gti
## 211 volkswagen      gti
## 212 volkswagen      gti
## 213 volkswagen      jetta
## 214 volkswagen      jetta
## 215 volkswagen      jetta
## 216 volkswagen      jetta
## 217 volkswagen      jetta
## 218 volkswagen      jetta
## 219 volkswagen      jetta
## 220 volkswagen      jetta
## 221 volkswagen      jetta
## 222 volkswagen      new beetle
## 223 volkswagen      new beetle
## 224 volkswagen      new beetle
## 225 volkswagen      new beetle
## 226 volkswagen      new beetle
## 227 volkswagen      new beetle
## 228 volkswagen      passat
## 229 volkswagen      passat
## 230 volkswagen      passat
## 231 volkswagen      passat
## 232 volkswagen      passat
## 233 volkswagen      passat
## 234 volkswagen      passat
```

```
uniqueMods <- unique(manufacturersModels)
uniqueMods
```

```
##      Manufacturer      Model
## 1      audi      a4
## 8      audi      a4 quattro
## 16     audi      a6 quattro
## 19     chevrolet    c1500 suburban 2wd
## 24     chevrolet    corvette
## 29     chevrolet    k1500 tahoe 4wd
## 33     chevrolet    malibu
## 38     dodge      caravan 2wd
## 49     dodge      dakota pickup 4wd
## 58     dodge      durango 4wd
## 65     dodge      ram 1500 pickup 4wd
## 75     ford      expedition 2wd
## 78     ford      explorer 4wd
## 84     ford      f150 pickup 4wd
## 91     ford      mustang
## 100    honda      civic
## 109    hyundai     sonata
## 116    hyundai     tiburon
## 123    jeep      grand cherokee 4wd
## 131    land rover   range rover
## 135    lincoln     navigator 2wd
## 138    mercury     mountaineer 4wd
```

```
## 142      nissan      altima
## 148      nissan      maxima
## 151      nissan      pathfinder 4wd
## 155      pontiac      grand prix
## 160      subaru      forester awd
## 166      subaru      impreza awd
## 174      toyota      4runner 4wd
## 180      toyota      camry
## 187      toyota      camry solara
## 194      toyota      corolla
## 199      toyota land cruiser wagon 4wd
## 201      toyota      toyota tacoma 4wd
## 208      volkswagen      gti
## 213      volkswagen      jetta
## 222      volkswagen      new beetle
## 228      volkswagen      passat
```

```
uniqueModsFactor <- factoredManufacturer <- as.factor(uniqueMods$Manufacturer)
```

#2b Graph the result by using plot() and ggplot(). Write the codes and its result.

```
library(ggplot2)
```

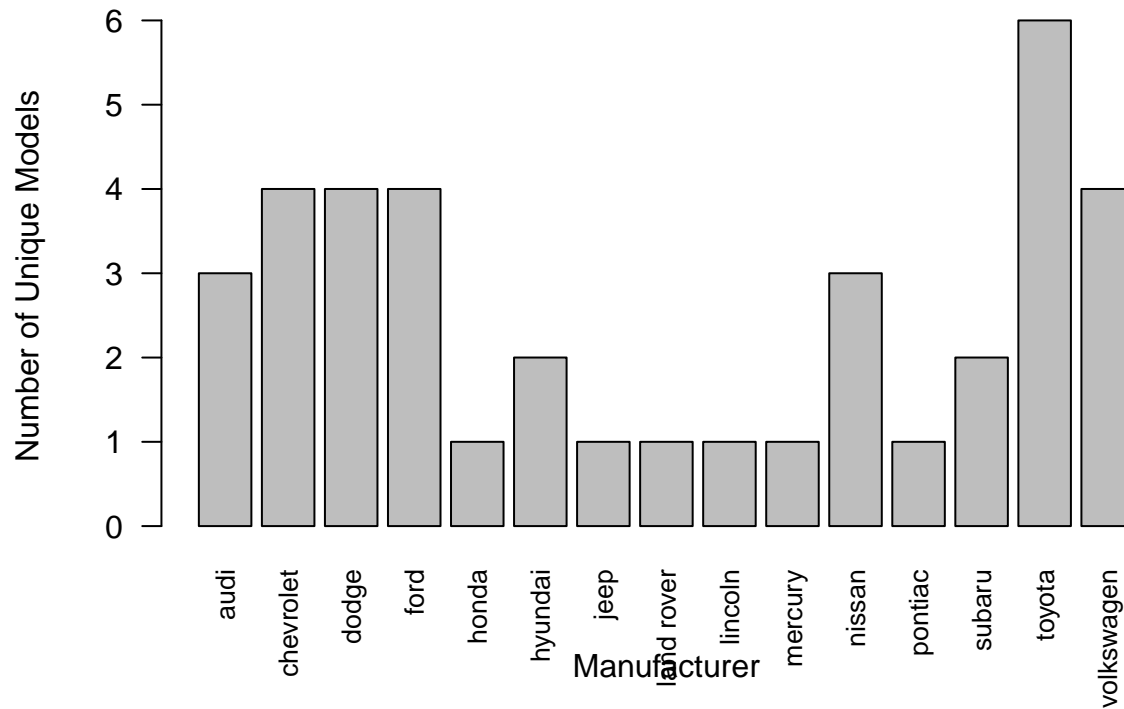
```
##
## Attaching package: 'ggplot2'
## The following object is masked _by_ '.GlobalEnv':
##
##      mpg
```

```
library(dplyr)
```

```
uniquePlot <- plot(as.factor(factoredManufacturer),
  main = "Unique Models of Manufacturers",
  xlab = "Manufacturer",
  ylab = "Number of Unique Models",
  cex.names = 0.8, las = 2)
```



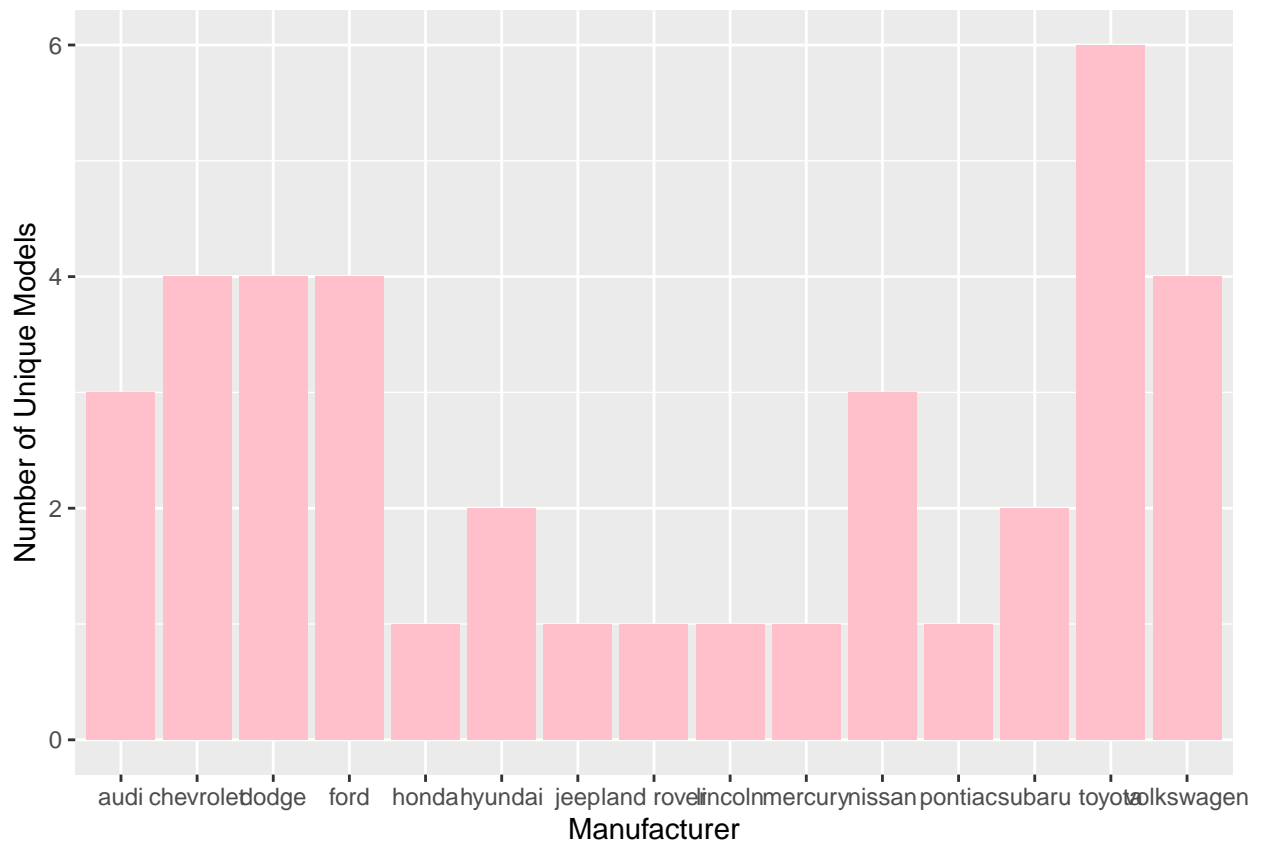
## Unique Models of Manufacturers



```
uniqueCount <- uniqueMods %>%
  count(uniqueMods$Manufacturer)
uniqueCount
```

```
##   uniqueMods$Manufacturer n
## 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
```

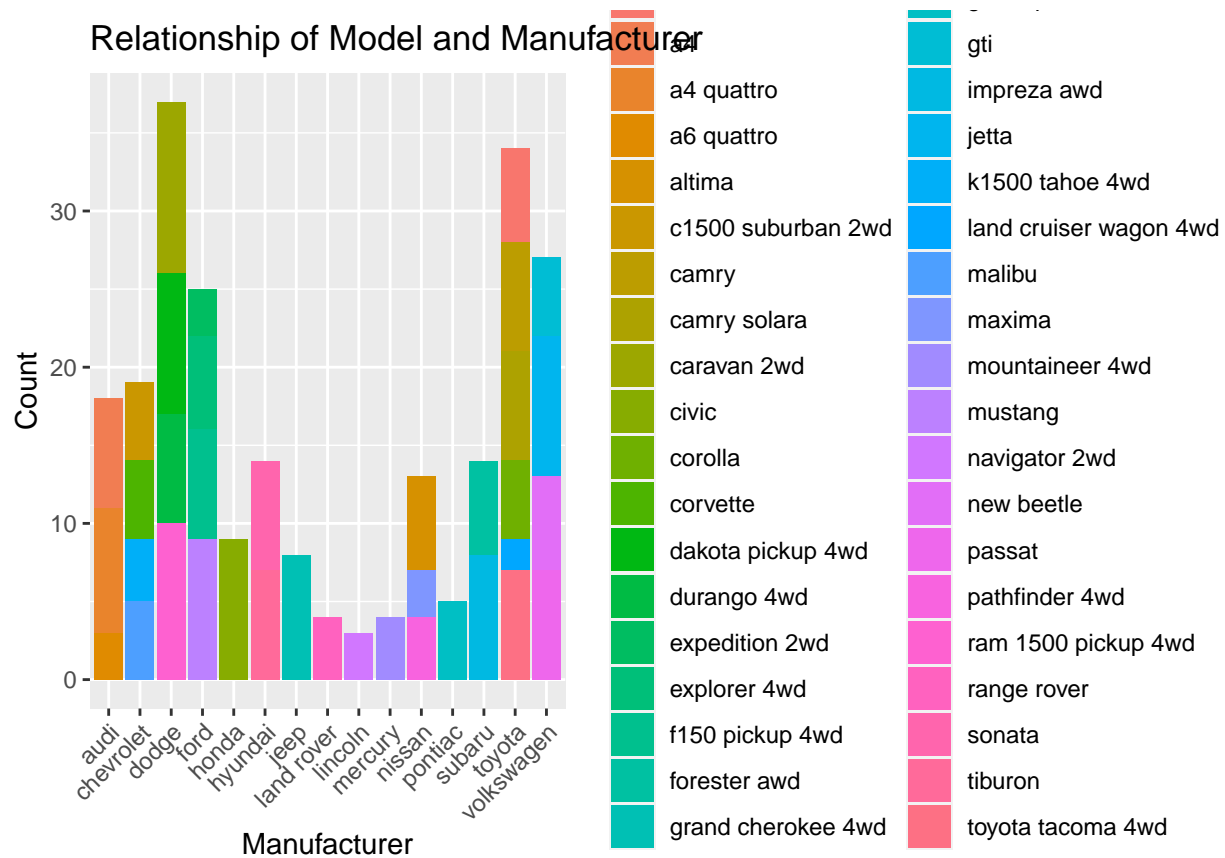
```
ggplot(uniqueCount, aes(x = `uniqueMods$Manufacturer`, y = n)) +
  geom_bar(stat = "identity", fill = "pink") +
  labs(x = "Manufacturer", y = "Number of Unique Models")
```



#2.1 Same dataset will be used. You are going to show the relationship of the model and the manufacturer.

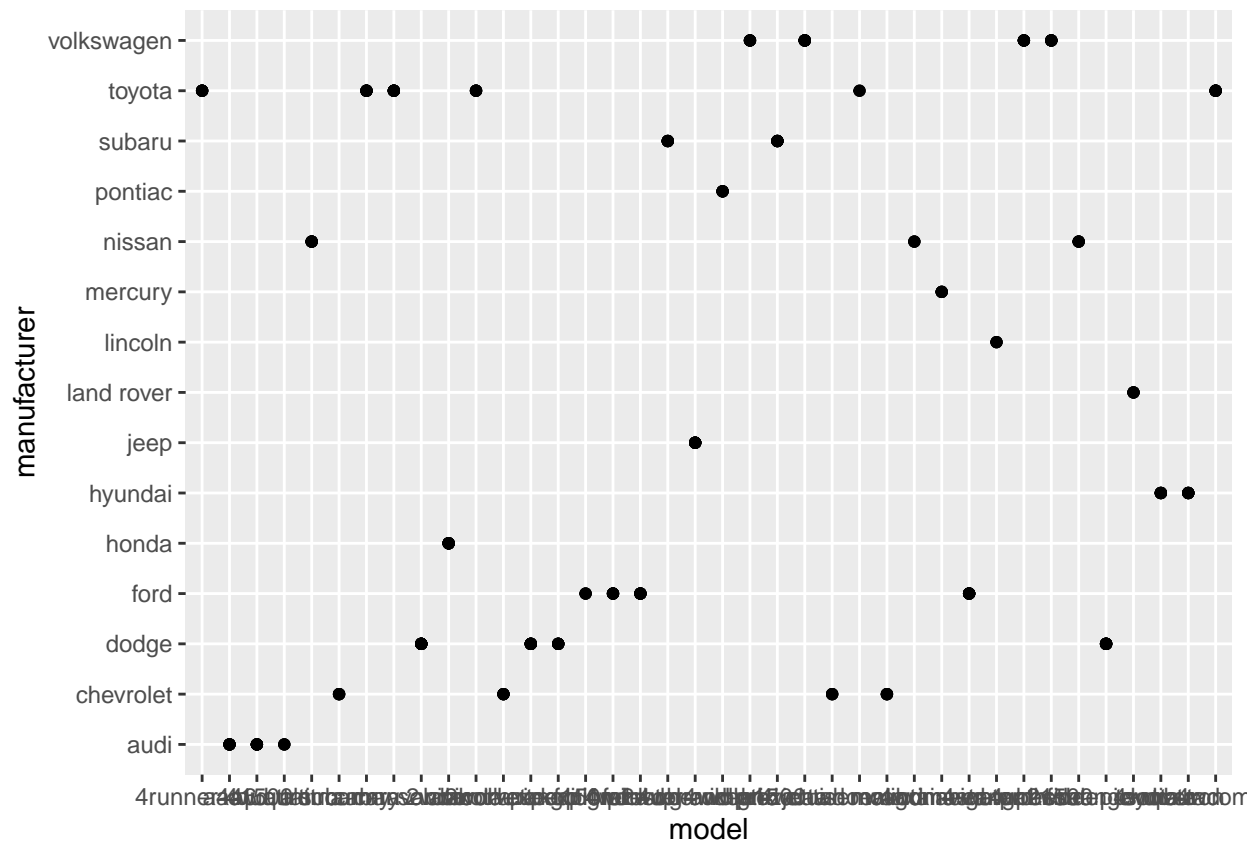
```
library(ggplot2)
```

```
ggplot(mpg, aes(x = manufacturer, fill = model)) +
  geom_bar() +
  labs(title = "Relationship of Model and Manufacturer",
       x = "Manufacturer",
       y = "Count",
       fill = "Model") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```



#2.1.a What does `ggplot(mpg, aes(model, manufacturer)) + geom_point()` show?

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

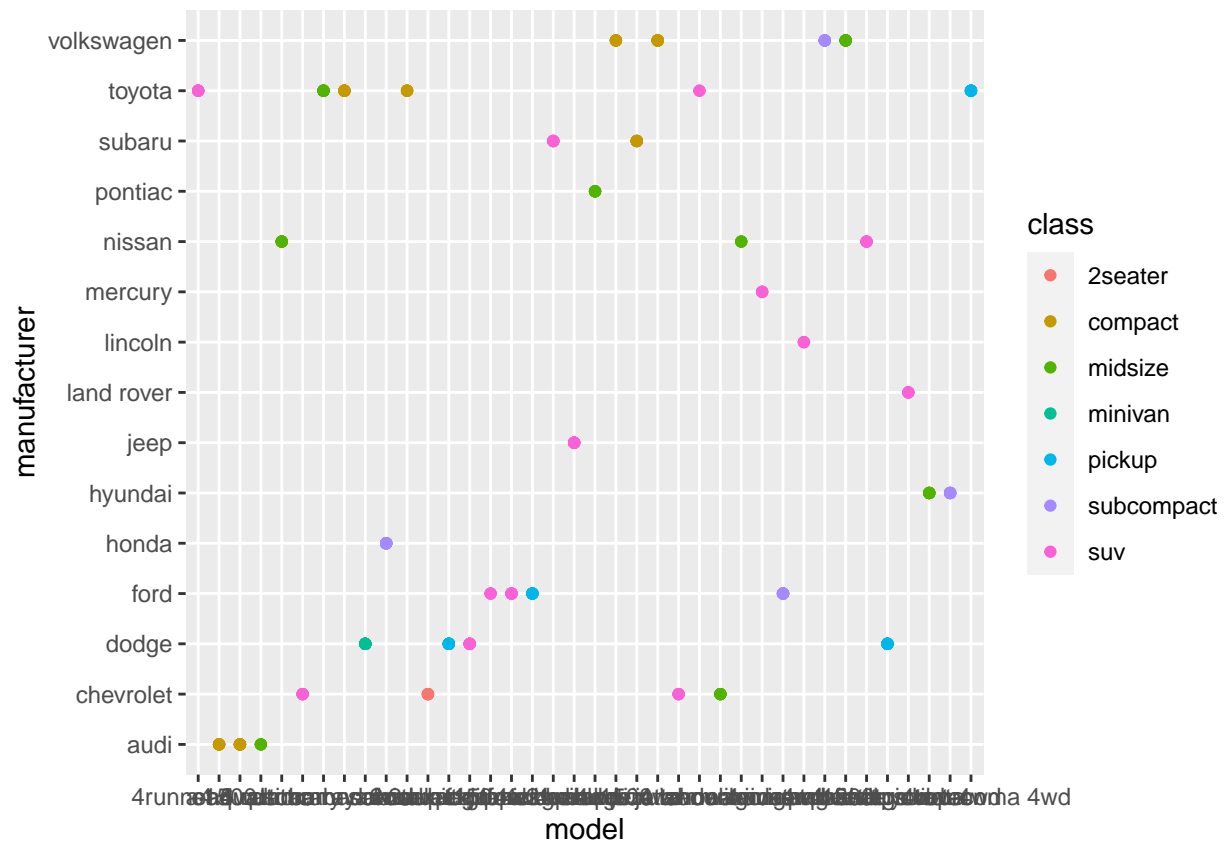


*#The "model" variable is represented by the x-axis. The variable "manufacturer" is represented by the y*

*#To add points to the plot, utilize the geom\_point() method. You will see a point for every combination*

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

```
ggplot(mpg, aes(x = model, y = manufacturer, color = class)) + geom_point()
```



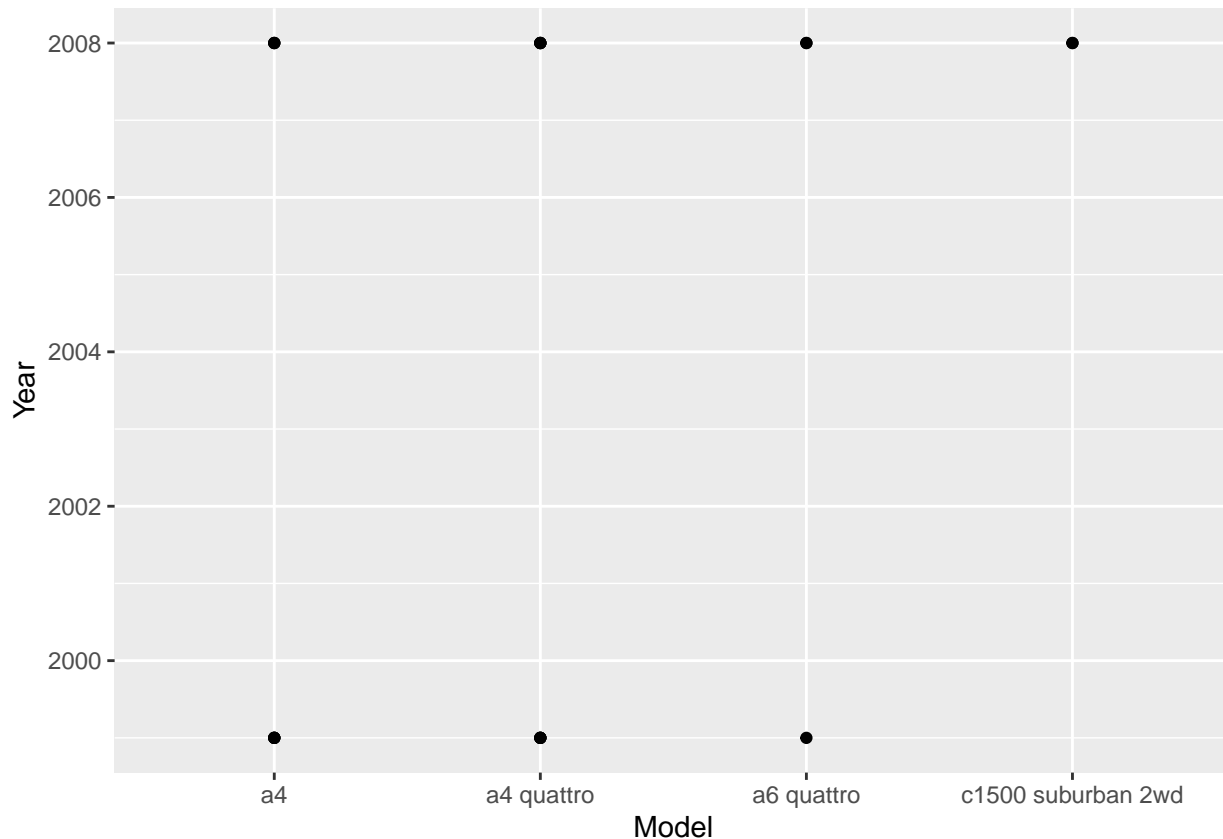
*#This data is helpful for assessing the quantity of models per manufacturer.*

*#To heighten its informativeness, I could introduce color-coded points reflecting the class variable and*

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

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

```
topPlot20 <- ggplot(top_20, aes(x = model, y = year)) + geom_point() + labs(x = "Model", y = "Year")
topPlot20
```



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

```
library(dplyr)
```

```
modelCarCount <- mpg %>%
  group_by(model) %>%
  summarize(numberOfCars = n())
```

```
modelCarCount
```

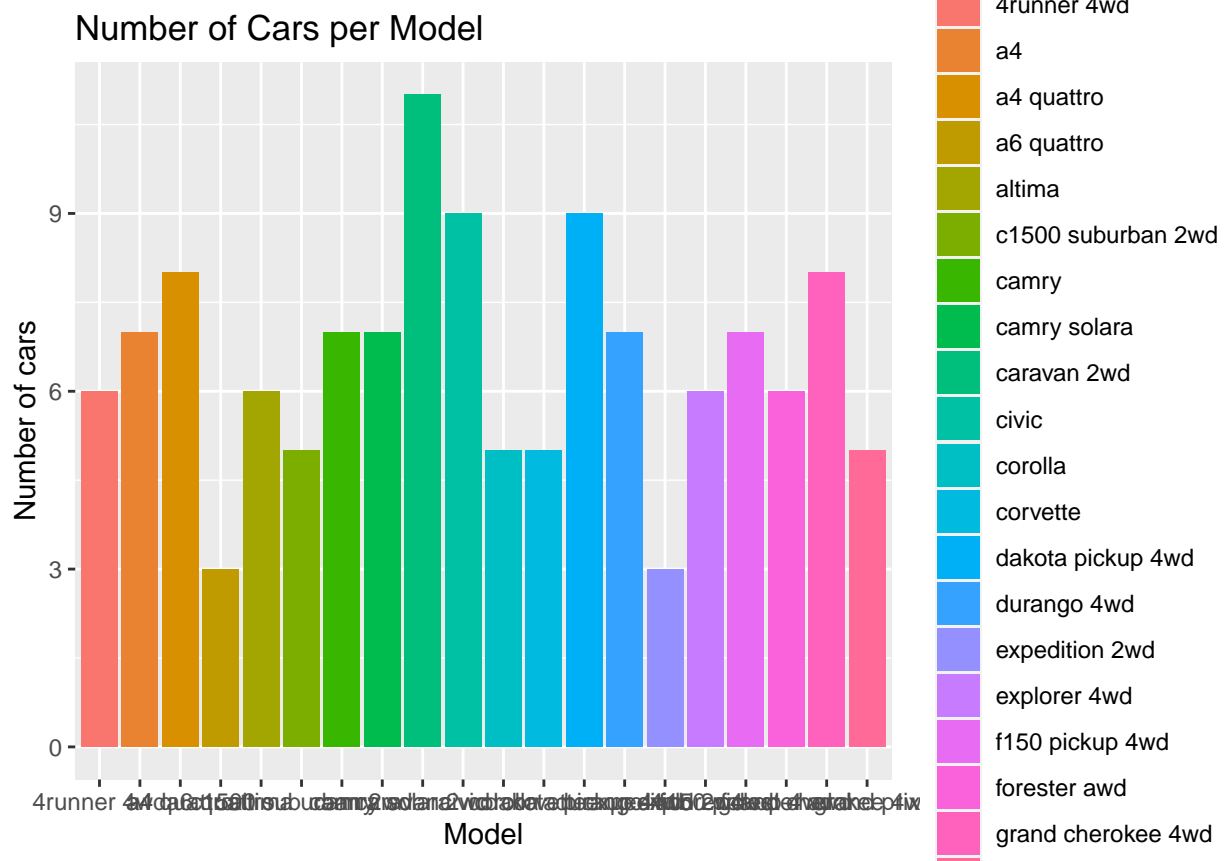
```
## # A tibble: 38 x 2
##   model          numberOfCars
##   <chr>             <int>
## 1 4runner 4wd         6
## 2 a4                 7
## 3 a4 quattro         8
## 4 a6 quattro         3
## 5 altima             6
## 6 c1500 suburban 2wd  5
## 7 camry              7
## 8 camry solara       7
##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

#4.a Plot the relationship between `cyl` - number of cylinders and `displ` - engine displacement using `geom_point` with aesthetic `color = engine displacement`. Title should be “Relationship between No. of Cylinders and Engine Displacement”.

```
obs20 <- head(modelCarCount, 20)
```

```
top_20 <- ggplot(obs20, aes(x = model, y = numberOfCars, fill = model)) +  
  geom_bar(stat = "identity") +  
  labs(title = "Number of Cars per Model",  
        x = "Model" ,  
        y = "Number of cars")
```

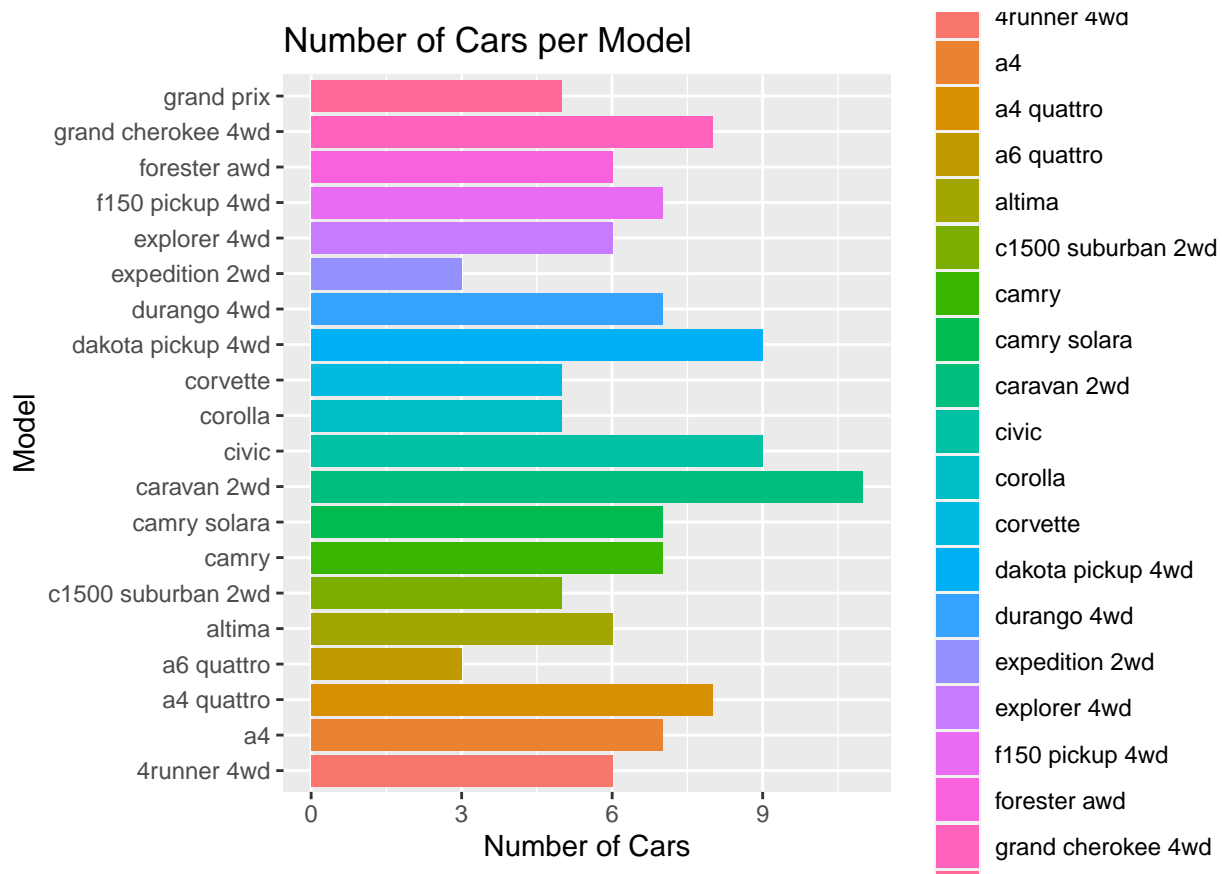
```
top_20
```



#4.b Plot using the geom\_bar() + coord\_flip() just like what is shown below. Show codes and its result.

```
flippedTop20 <- ggplot(obs20, aes(x = model, y = numberOfCars, fill = model)) +  
  geom_bar(stat = "identity") + labs(title = "Number of Cars per Model", x = "Model" ,  
                                     y = "Number of Cars")+ coord_flip()
```

```
flippedTop20
```

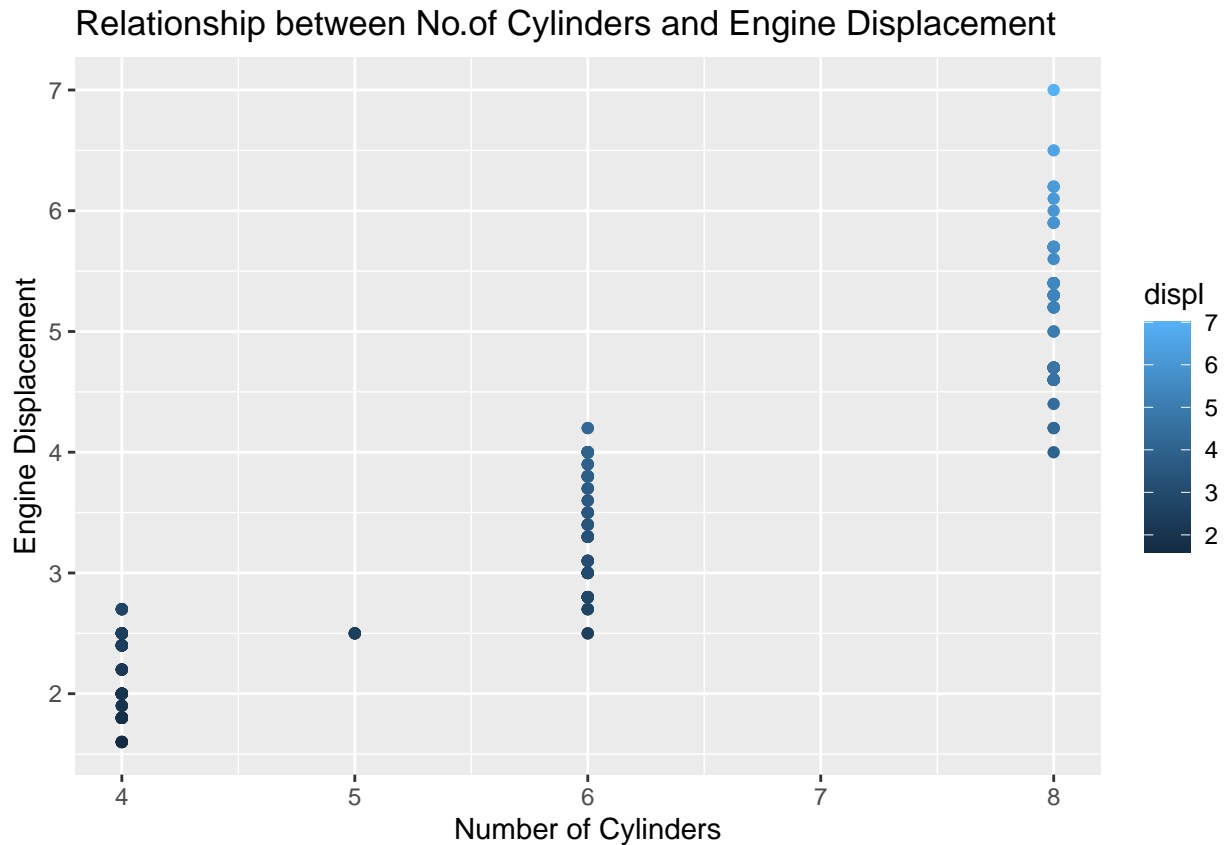


#5. Plot the relationship between cyl - number of cylinders and displ - engine displacement using `geom_point` with aesthetic color = engine displacement. Title should be "Relationship between No. of Cylinders and Engine Displacement".

```
cylDisplayPlot <- ggplot(mpg, aes(x = cyl, y = displ, color = displ)) + geom_point() + labs(title = "Relationship between No. of Cylinders and Engine Displacement")
```

```
cylDisplayPlot
```





#5.a How would you describe its relationship? Show the codes and its result.

*#This will produce a scatter plot illustrating how the number of cylinders relates to engine displacement*

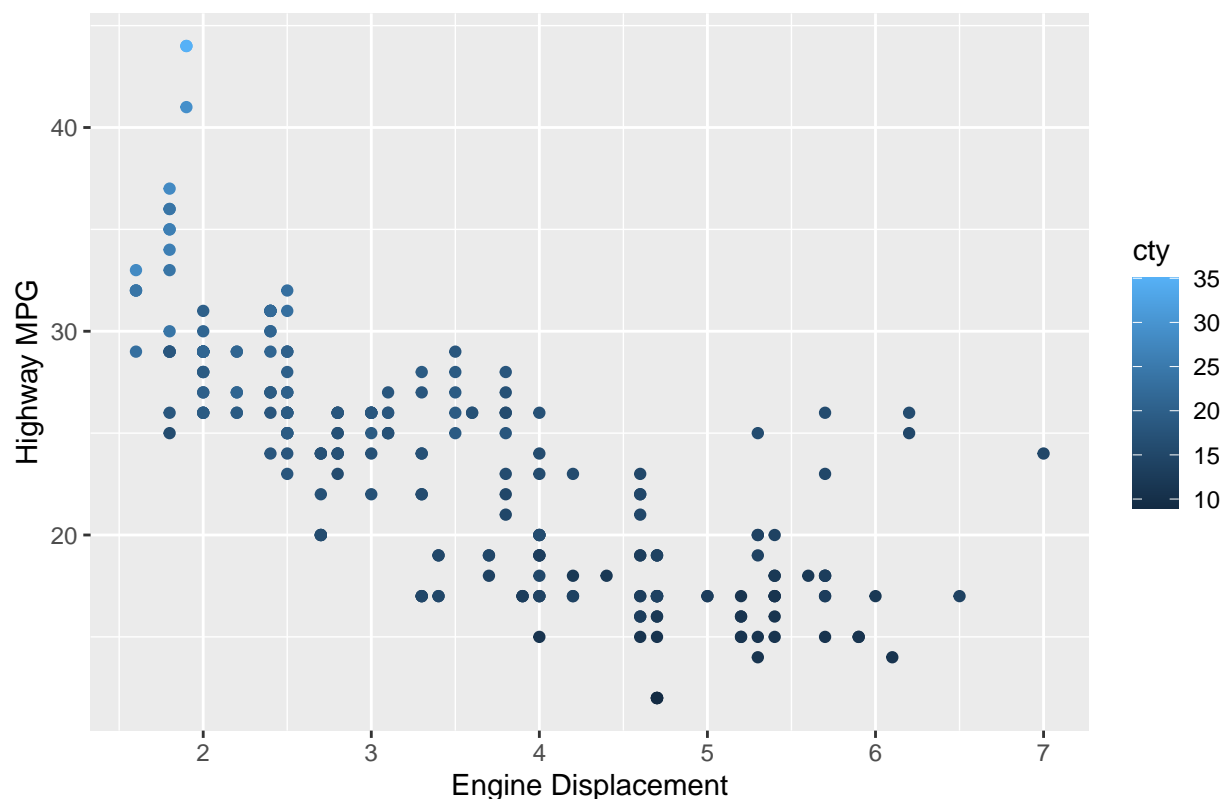
*#As cylinder count rises, engine displacement generally follows suit. This indicates a trend where larger*

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

```
displayHwyPlot <- ggplot(mpg, aes(x = displ, y = hwy, color = cty)) +
  geom_point() +
  labs(title = "Relationship between Engine Displacement and Highway MPG",
       x = "Engine Displacement",
       y = "Highway MPG")
```

displayHwyPlot

# Relationship between Engine Displacement and Highway MPG



*#This scatterplot exhibits engine displacement on the x-axis and highway miles per gallon on the y-axis*

*#By examining this plot, we gain insight into the correlations among displacement, highway efficiency,*

*#This analysis helps us grasp how vehicles with diverse engine sizes perform in terms of fuel efficiency.*

#7. From alexa\_file.xlsx, import it to your environment

#7.a How many observations does alexa\_file has? What about the number of columns? Show your solution and answer.

```
library(readxl)

alexaData <- read_excel("/cloud/project/Worksheet#4/Worksheet4c/alexa_file.xlsx")

numObservation <- nrow(alexaData)
numObservation
```

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

```
numCols <- ncol(alexaData)
numCols
```

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

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

```
library(dplyr)

varCounts <- alexaData %>%
```

```
count(variation)
```

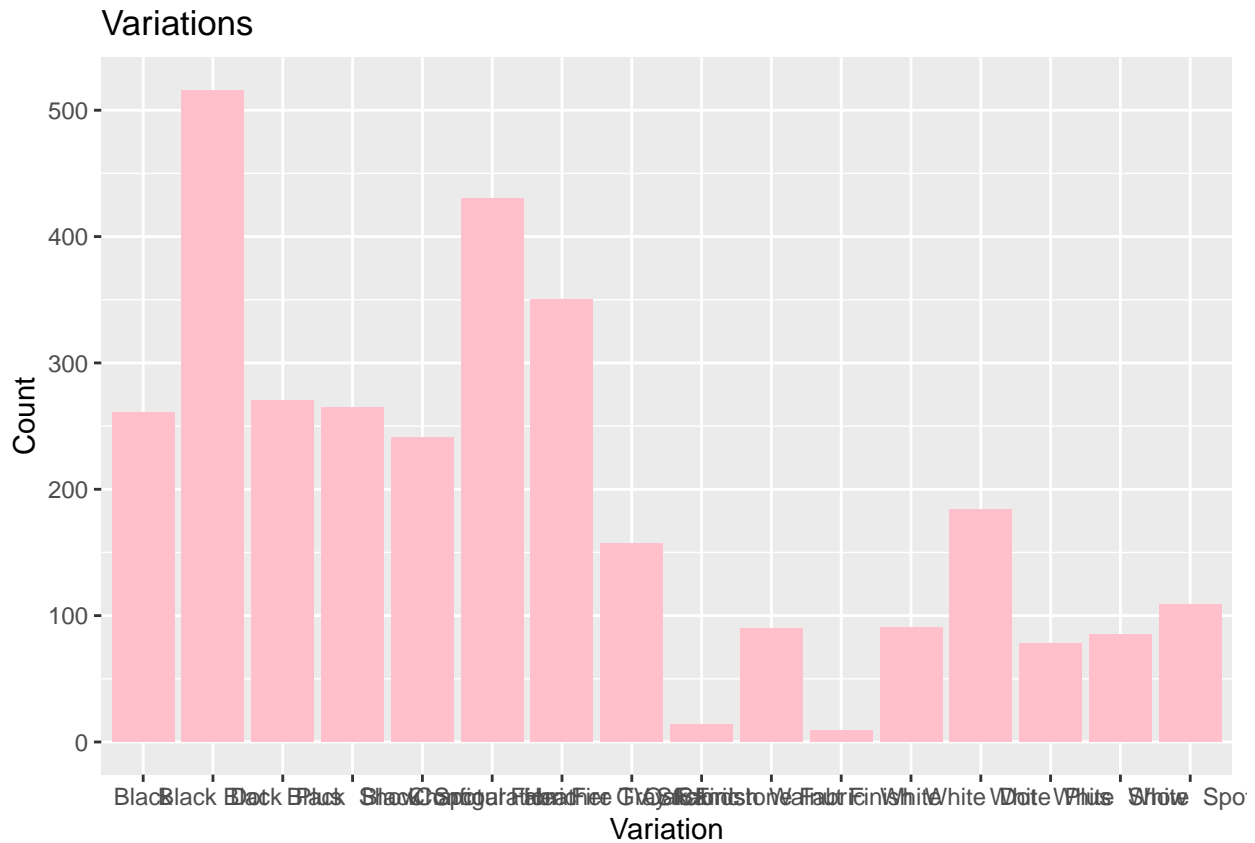
```
varCounts
```

```
## # A tibble: 16 x 2
##   variation      n
##   <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
```

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

```
alexaPlot <- ggplot(alexaData, aes(x = variation)) +
  geom_bar(fill = "pink") +
  labs(title = "Variations",
       x = "Variation",
       y = "Count")
```

```
alexaPlot
```



*#The visual displays the spread of different variations alongside their corresponding counts. Each bar*

7.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

```
library(dplyr)
library(ggplot2)

alexaData$date <- as.Date(alexaData$date)

alexaData$month <- format(alexaData$date, "%m")

countMonth <- alexaData %>%
  count(month)
countMonth

## # A tibble: 3 x 2
##   month     n
##   <chr> <int>
## 1 05      82
## 2 06     155
## 3 07    2913

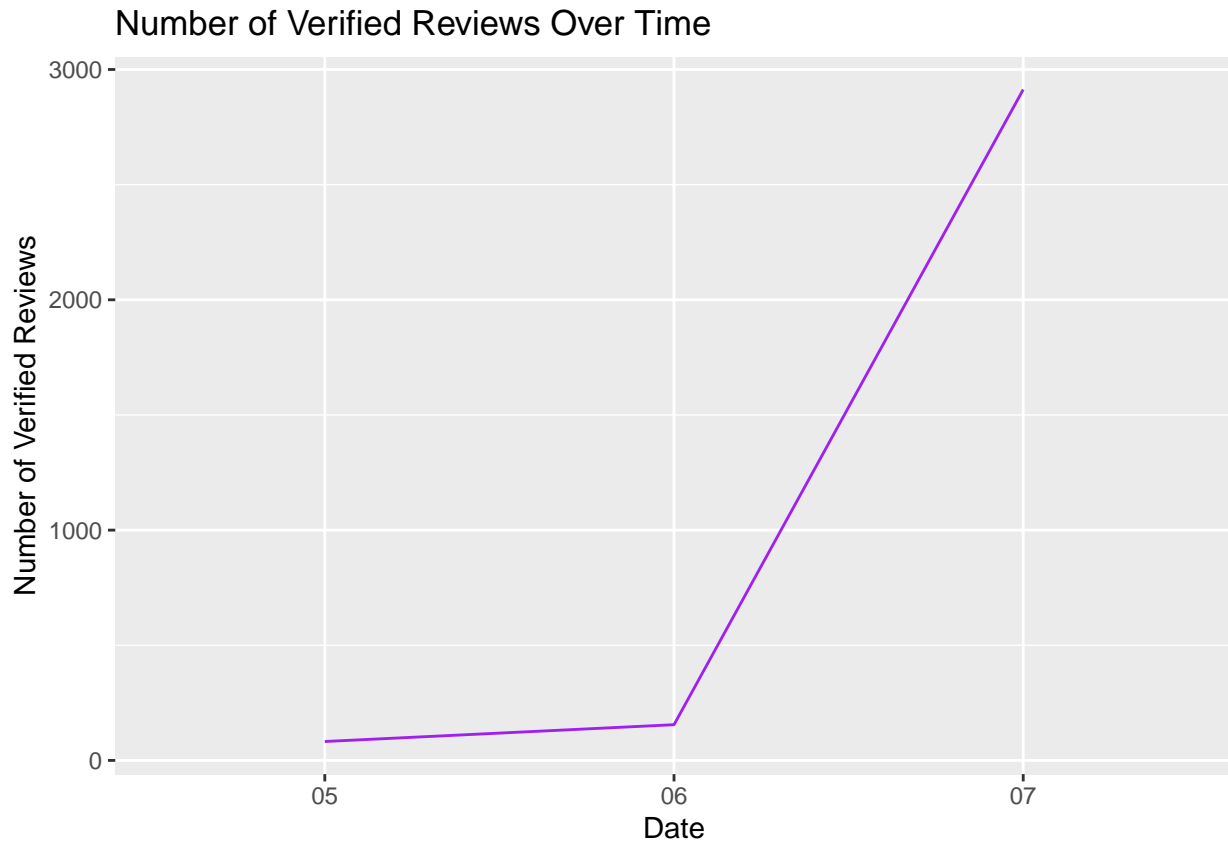
monthlyRevCount <- table(countMonth)
monthlyRevCount

##           n
## month 82 155 2913
```

```
##    05  1   0   0
##    06  0   1   0
##    07  0   0   1
```

```
alexLine <- ggplot(countMonth, aes(x = month, y = n, group = 1)) +
  geom_line(color = "purple") +
  labs(title = "Number of Verified Reviews Over Time",
       x = "Date",
       y = "Number of Verified Reviews")
```

```
alexLine
```



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

```
variationRatings <- alexaData %>%
  group_by(variation) %>%
  summarise(avgRating = mean(rating))
```

```
variationRatings
```

```
## # A tibble: 16 x 2
##   variation          avgRating
##   <chr>          <dbl>
## 1 Black          4.23
## 2 Black Dot      4.45
## 3 Black Plus     4.37
## 4 Black Show     4.49
## 5 Black Spot     4.31
```

```
## 6 Charcoal Fabric 4.73
## 7 Configuration: Fire TV Stick 4.59
## 8 Heather Gray Fabric 4.69
## 9 Oak Finish 4.86
## 10 Sandstone Fabric 4.36
## 11 Walnut Finish 4.89
## 12 White 4.14
## 13 White Dot 4.42
## 14 White Plus 4.36
## 15 White Show 4.28
## 16 White Spot 4.31
```

```
highestRatings <- variationRatings %>%
  filter(avgRating == max(avgRating))
```

```
highestRatings
```

```
## # A tibble: 1 x 2
##   variation      avgRating
##   <chr>         <dbl>
## 1 Walnut Finish 4.89
```

```
# The finish variation that has the highest rating is the walnut
```

```
ggplot(variationRatings, aes(x = variation, y = avgRating)) + geom_bar(stat = "identity", fill = "purple")
```

