

# RWorksheet\_DelaCruz#4c

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

##	X	manufacturer	model	displ	year	cyl	trans	drv	cty
## 1	1	audi	a4	1.8	1999	4	auto(l5)	f	18
## 2	2	audi	a4	1.8	1999	4	manual(m5)	f	21
## 3	3	audi	a4	2.0	2008	4	manual(m6)	f	20
## 4	4	audi	a4	2.0	2008	4	auto(av)	f	21
## 5	5	audi	a4	2.8	1999	6	auto(l5)	f	16
## 6	6	audi	a4	2.8	1999	6	manual(m5)	f	18
## 7	7	audi	a4	3.1	2008	6	auto(av)	f	18
## 8	8	audi	a4 quattro	1.8	1999	4	manual(m5)	4	18
## 9	9	audi	a4 quattro	1.8	1999	4	auto(l5)	4	16
## 10	10	audi	a4 quattro	2.0	2008	4	manual(m6)	4	20
## 11	11	audi	a4 quattro	2.0	2008	4	auto(s6)	4	19
## 12	12	audi	a4 quattro	2.8	1999	6	auto(l5)	4	15
## 13	13	audi	a4 quattro	2.8	1999	6	manual(m5)	4	17
## 14	14	audi	a4 quattro	3.1	2008	6	auto(s6)	4	17
## 15	15	audi	a4 quattro	3.1	2008	6	manual(m6)	4	15
## 16	16	audi	a6 quattro	2.8	1999	6	auto(l5)	4	15
## 17	17	audi	a6 quattro	3.1	2008	6	auto(s6)	4	17
## 18	18	audi	a6 quattro	4.2	2008	8	auto(s6)	4	16
## 19	19	chevrolet	c1500 suburban 2wd	5.3	2008	8	auto(l4)	r	14
## 20	20	chevrolet	c1500 suburban 2wd	5.3	2008	8	auto(l4)	r	11
## 21	21	chevrolet	c1500 suburban 2wd	5.3	2008	8	auto(l4)	r	14
## 22	22	chevrolet	c1500 suburban 2wd	5.7	1999	8	auto(l4)	r	13
## 23	23	chevrolet	c1500 suburban 2wd	6.0	2008	8	auto(l4)	r	12
## 24	24	chevrolet	corvette	5.7	1999	8	manual(m6)	r	16
## 25	25	chevrolet	corvette	5.7	1999	8	auto(l4)	r	15
## 26	26	chevrolet	corvette	6.2	2008	8	manual(m6)	r	16
## 27	27	chevrolet	corvette	6.2	2008	8	auto(s6)	r	15
## 28	28	chevrolet	corvette	7.0	2008	8	manual(m6)	r	15
## 29	29	chevrolet	k1500 tahoe 4wd	5.3	2008	8	auto(l4)	4	14
## 30	30	chevrolet	k1500 tahoe 4wd	5.3	2008	8	auto(l4)	4	11
## 31	31	chevrolet	k1500 tahoe 4wd	5.7	1999	8	auto(l4)	4	11
## 32	32	chevrolet	k1500 tahoe 4wd	6.5	1999	8	auto(l4)	4	14
## 33	33	chevrolet	malibu	2.4	1999	4	auto(l4)	f	19
## 34	34	chevrolet	malibu	2.4	2008	4	auto(l4)	f	22
## 35	35	chevrolet	malibu	3.1	1999	6	auto(l4)	f	18
## 36	36	chevrolet	malibu	3.5	2008	6	auto(l4)	f	18
## 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

*#Categorical data includes the manufacturer, model name, transmission, year, number of cylinders, type of engine, etc.*  
*#The continuous variables are engine displacement, city miles per gallon, highway miles per gallon*

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

```
manufacturers <- factor(mpg$manufacturer)
manufacturers
```

```
##      [1] audi      audi      audi      audi      audi      audi
##      [7] audi      audi      audi      audi      audi      audi
##     [13] audi      audi      audi      audi      audi      audi
##     [19] chevrolet chevrolet chevrolet chevrolet chevrolet chevrolet
##     [25] chevrolet chevrolet chevrolet chevrolet chevrolet chevrolet
##     [31] chevrolet chevrolet chevrolet chevrolet chevrolet chevrolet
##     [37] chevrolet dodge     dodge     dodge     dodge     dodge
##     [43] dodge     dodge     dodge     dodge     dodge     dodge
##     [49] dodge     dodge     dodge     dodge     dodge     dodge
##     [55] dodge     dodge     dodge     dodge     dodge     dodge
##     [61] dodge     dodge     dodge     dodge     dodge     dodge
##     [67] dodge     dodge     dodge     dodge     dodge     dodge
##     [73] dodge     dodge     ford      ford      ford      ford
##     [79] ford      ford      ford      ford      ford      ford
##     [85] ford      ford      ford      ford      ford      ford
##     [91] ford      ford      ford      ford      ford      ford
##     [97] ford      ford      ford      honda     honda     honda
##    [103] honda     honda     honda     honda     honda     honda
##    [109] hyundai   hyundai   hyundai   hyundai   hyundai   hyundai
##    [115] hyundai   hyundai   hyundai   hyundai   hyundai   hyundai
##    [121] hyundai   hyundai   jeep      jeep      jeep      jeep
##    [127] jeep      jeep      jeep      jeep      land rover land rover
##    [133] land rover land rover lincoln  lincoln  lincoln  mercury
##    [139] mercury   mercury   mercury   nissan     nissan     nissan
##    [145] nissan     nissan     nissan     nissan     nissan     nissan
##    [151] nissan     nissan     nissan     nissan     pontiac    pontiac
##    [157] pontiac    pontiac    pontiac    subaru     subaru     subaru
##    [163] subaru     subaru     subaru     subaru     subaru     subaru
##    [169] subaru     subaru     subaru     subaru     subaru     toyota
##    [175] toyota     toyota     toyota     toyota     toyota     toyota
##    [181] toyota     toyota     toyota     toyota     toyota     toyota
##    [187] toyota     toyota     toyota     toyota     toyota     toyota
##    [193] toyota     toyota     toyota     toyota     toyota     toyota
##    [199] toyota     toyota     toyota     toyota     toyota     toyota
##    [205] toyota     toyota     toyota     volkswagen volkswagen volkswagen
##    [211] volkswagen volkswagen volkswagen volkswagen volkswagen volkswagen
##    [217] volkswagen volkswagen volkswagen volkswagen volkswagen volkswagen
##    [223] volkswagen volkswagen volkswagen volkswagen volkswagen volkswagen
##    [229] volkswagen volkswagen volkswagen volkswagen volkswagen volkswagen
## 15 Levels: audi chevrolet dodge ford honda hyundai jeep land rover ... volkswagen
```

*#b. Which are continuous variables?*

```
class(mpg$displ)
```

```
## [1] "numeric"
```

```
library("dplyr")
```

```
## Warning: package 'dplyr' was built under R version 4.3.2
```

```
##
```

```
## 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
```

```
countMPG <- mpg %>%  
count(manufacturer,model)
```

```
countMPG
```

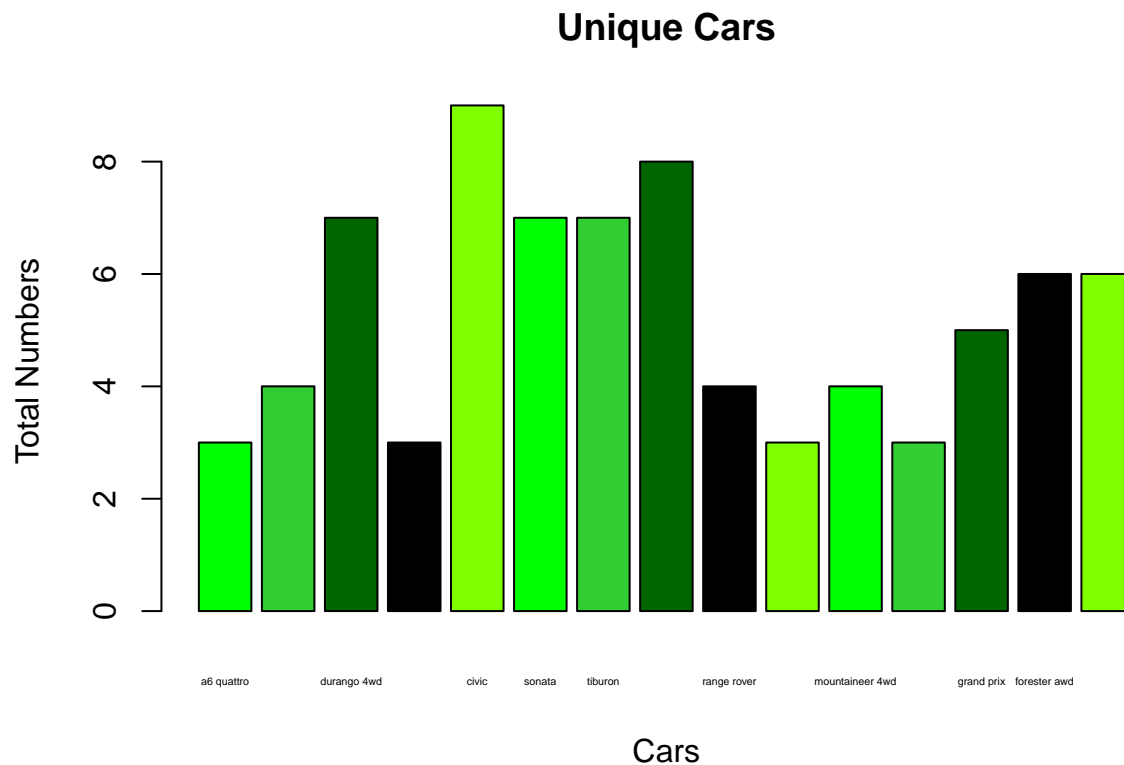
```
##   manufacturer      model  n  
## 1         audi          a4  7  
## 2         audi      a4 quattro  8  
## 3         audi      a6 quattro  3  
## 4    chevrolet c1500 suburban 2wd  5  
## 5    chevrolet      corvette  5  
## 6    chevrolet k1500 tahoe 4wd  4  
## 7    chevrolet      malibu  5  
## 8         dodge      caravan 2wd 11  
## 9         dodge dakota pickup 4wd  9  
## 10        dodge      durango 4wd  7  
## 11        dodge ram 1500 pickup 4wd 10  
## 12         ford      expedition 2wd  3  
## 13         ford      explorer 4wd  6  
## 14         ford      f150 pickup 4wd  7  
## 15         ford      mustang  9  
## 16         honda      civic  9  
## 17        hyundai      sonata  7  
## 18        hyundai      tiburon  7  
## 19         jeep      grand cherokee 4wd  8  
## 20    land rover      range rover  4  
## 21        lincoln      navigator 2wd  3  
## 22        mercury      mountaineer 4wd  4  
## 23         nissan      altima  6  
## 24         nissan      maxima  3  
## 25         nissan      pathfinder 4wd  4  
## 26        pontiac      grand prix  5  
## 27         subaru      forester awd  6  
## 28         subaru      impreza awd  8  
## 29         toyota      4runner 4wd  6  
## 30         toyota      camry  7  
## 31         toyota      camry solara  7
```

```
## 32      toyota      corolla 5
## 33      toyota land cruiser wagon 4wd 2
## 34      toyota      toyota tacoma 4wd 7
## 35      volkswagen      gti 5
## 36      volkswagen      jetta 9
## 37      volkswagen      new beetle 6
## 38      volkswagen      passat 7
```

```
uniqueMPG <- countMPG[c(3,6,10,12,16:22,24,26,27,29),1:3,]
uniqueMPG
```

```
##      manufacturer      model n
## 3      audi      a6 quattro 3
## 6      chevrolet      k1500 tahoe 4wd 4
## 10     dodge      durango 4wd 7
## 12     ford      expedition 2wd 3
## 16     honda      civic 9
## 17     hyundai      sonata 7
## 18     hyundai      tiburon 7
## 19     jeep grand cherokee 4wd 8
## 20     land rover      range rover 4
## 21     lincoln      navigator 2wd 3
## 22     mercury      mountaineer 4wd 4
## 24     nissan      maxima 3
## 26     pontiac      grand prix 5
## 27     subaru      forester awd 6
## 29     toyota      4runner 4wd 6
```

```
barplot(uniqueMPG$n, main = "Unique Cars",
        xlab = "Cars",
        ylab = "Total Numbers",
        names.arg = uniqueMPG$model,
        cex.names = 0.35,
        col = c("green", "limegreen", "darkgreen", "black", "chartreuse"))
```



```
library("ggplot2")
```

```
## Warning: package 'ggplot2' was built under R version 4.3.2
```

```
##
```

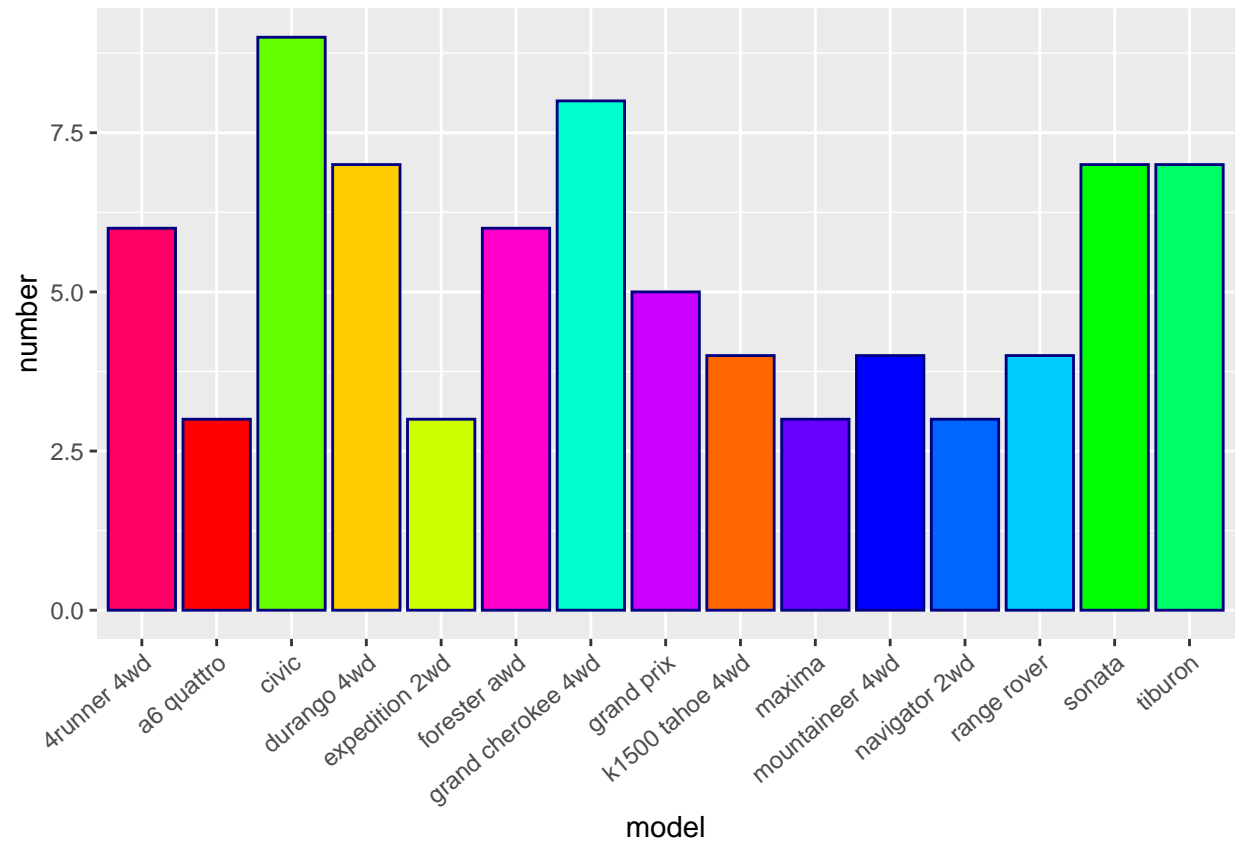
```
## Attaching package: 'ggplot2'
```

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

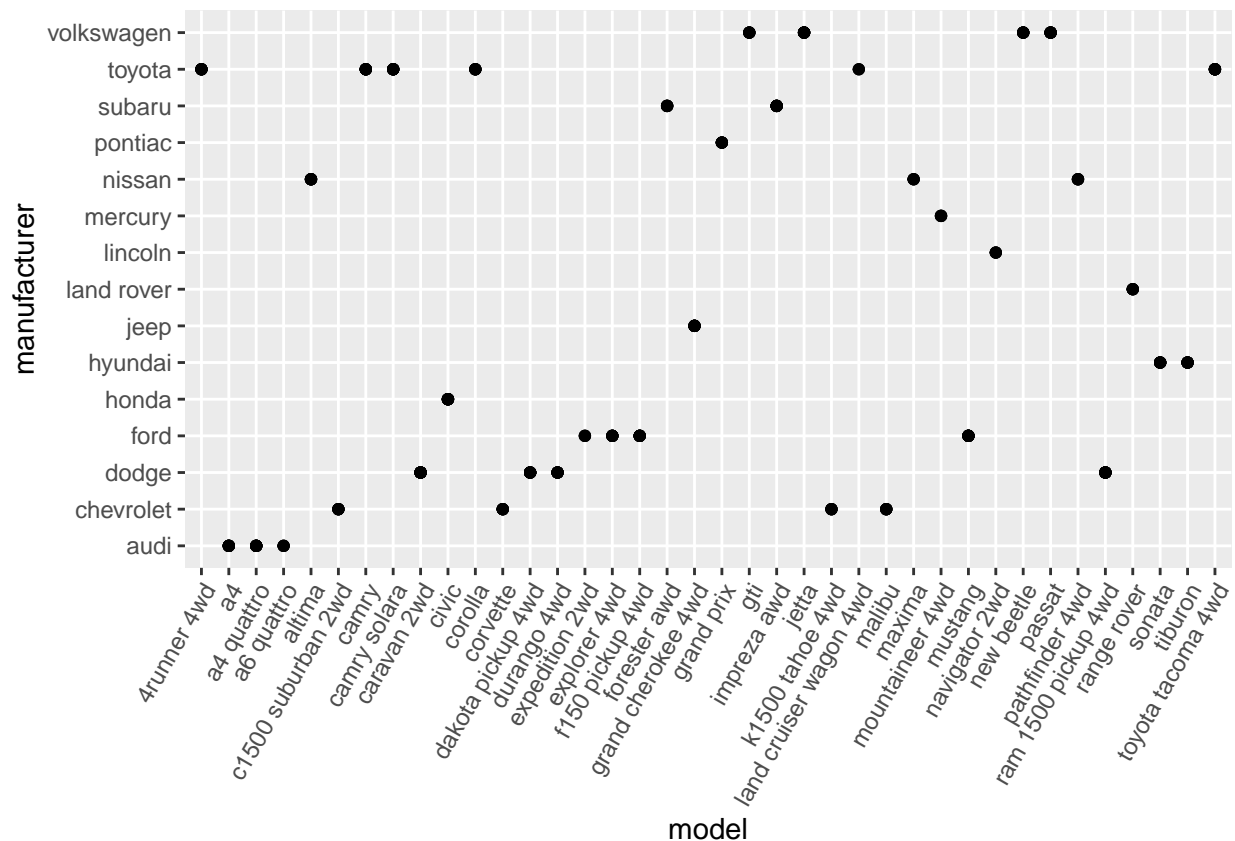
```
##
```

```
##      mpg
```

```
number <- uniqueMPG$n
model <- uniqueMPG$model
ggplot(data = uniqueMPG,
  aes(x= model, y= number)) +
  geom_bar(stat='identity',fill = rainbow(15),
  col = "navy") +
  scale_x_discrete(guide = guide_axis(angle = 40))
```



```
ggplot(mpg, aes(model,manufacturer)) + geom_point() + scale_x_discrete(guide = guide_axis(angle = 60))
```



*# This plot is not as useful. In order to modify it we need to choose a graph that suits the data set.*

```
first20 <- mpg[1:20,1:11]
first20
```

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

```
first20_model <- first20$model
first20_model
```

```
## [1] "a4" "a4" "a4"
## [4] "a4" "a4" "a4"
## [7] "a4" "a4 quattro" "a4 quattro"
## [10] "a4 quattro" "a4 quattro" "a4 quattro"
## [13] "a4 quattro" "a4 quattro" "a4 quattro"
## [16] "a6 quattro" "a6 quattro" "a6 quattro"
## [19] "c1500 suburban 2wd" "c1500 suburban 2wd"
```

```
first20_num <- first20$n
first20_num
```

```
## NULL
```