

RWorksheet_Vicinte#4c

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```
#a.  
mpgdata <- read.csv("/cloud/project/RWorkSheet#4c/mpg.csv")  
mpgdata
```

##	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(l3)	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(14)	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(14)	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(15)	4	16
##	208	208	volkswagen	gti	2.0	1999	4	manual(m5)	f	21
##	209	209	volkswagen	gti	2.0	1999	4	auto(14)	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(14)	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(14)	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(14)	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(14)	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(15)	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(15)	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. Which variables from mpg dataset are categorical?
factoreddata <- str(mpgdata)
```

```
## 'data.frame': 234 obs. of 12 variables:
## $ X : int 1 2 3 4 5 6 7 8 9 10 ...
## $ manufacturer: chr "audi" "audi" "audi" "audi" ...
## $ model : chr "a4" "a4" "a4" "a4" ...
## $ displ : num 1.8 1.8 2 2 2.8 2.8 3.1 1.8 1.8 2 ...
## $ year : int 1999 1999 2008 2008 1999 1999 2008 1999 1999 2008 ...
## $ cyl : int 4 4 4 4 6 6 6 4 4 4 ...
## $ trans : chr "auto(l5)" "manual(m5)" "manual(m6)" "auto(av)" ...
## $ drv : chr "f" "f" "f" "f" ...
## $ cty : int 18 21 20 21 16 18 18 18 16 20 ...
## $ hwy : int 29 29 31 30 26 26 27 26 25 28 ...
## $ fl : chr "p" "p" "p" "p" ...
## $ class : chr "compact" "compact" "compact" "compact" ...
```

```
factoreddata
```

```
## NULL
```

```
#These are the categorical variable from mpg dataset.
#manufacturer
#model
#trans
#drv
#fl
#class
```

```
#c. Which are continuous variables?
##These are the continuous variable from mpg dataset.
#displ
#year
#cty
#hwy
```

```
#2.a
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
## filter, lag

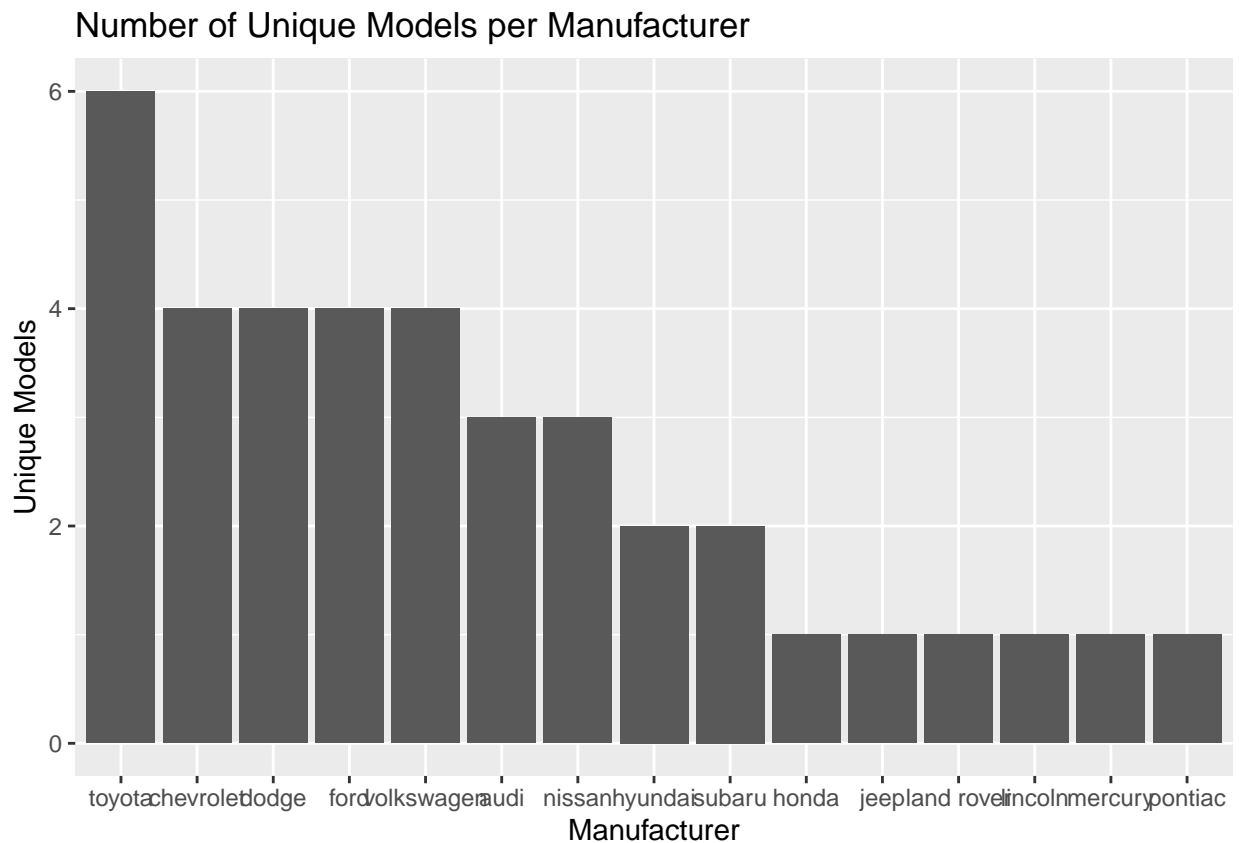
## The following objects are masked from 'package:base':
##
## intersect, setdiff, setequal, union
```

```
mpg_summary <- mpgdata %>%
  group_by(manufacturer) %>%
  summarize(UniqueModels = n_distinct(model)) %>%
  arrange(desc(UniqueModels))
mpg_summary
```

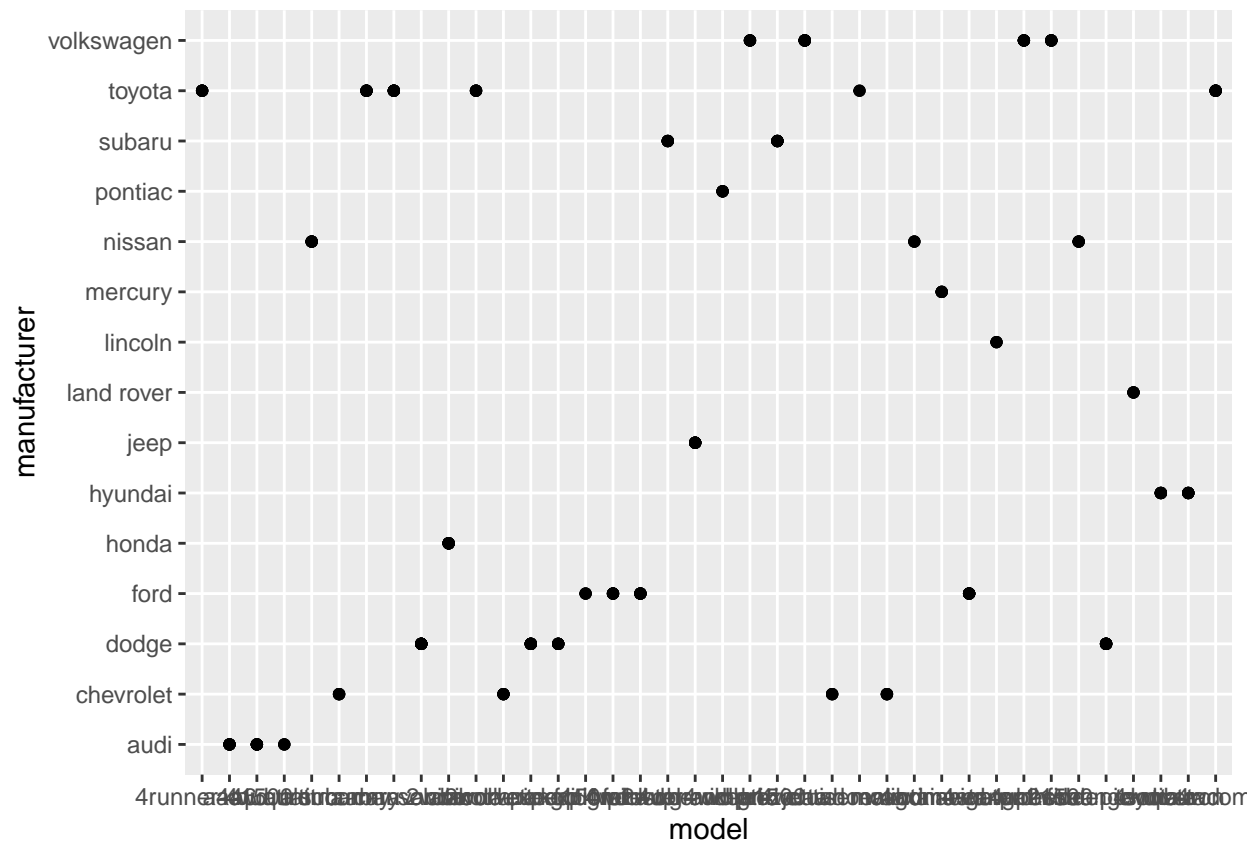
```
## # A tibble: 15 x 2
## manufacturer UniqueModels
```

```
##      <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.
library(ggplot2)
ggplot(mpg_summary, aes(x = reorder(manufacturer, -UniqueModels), y = UniqueModels)) +
  geom_bar(stat = "identity") +
  labs(title = "Number of Unique Models per Manufacturer",
       x = "Manufacturer",
       y = "Unique Models")
```



```
#2a.
ggplot(mpgdata, aes(x = model, y = manufacturer)) + geom_point()
```

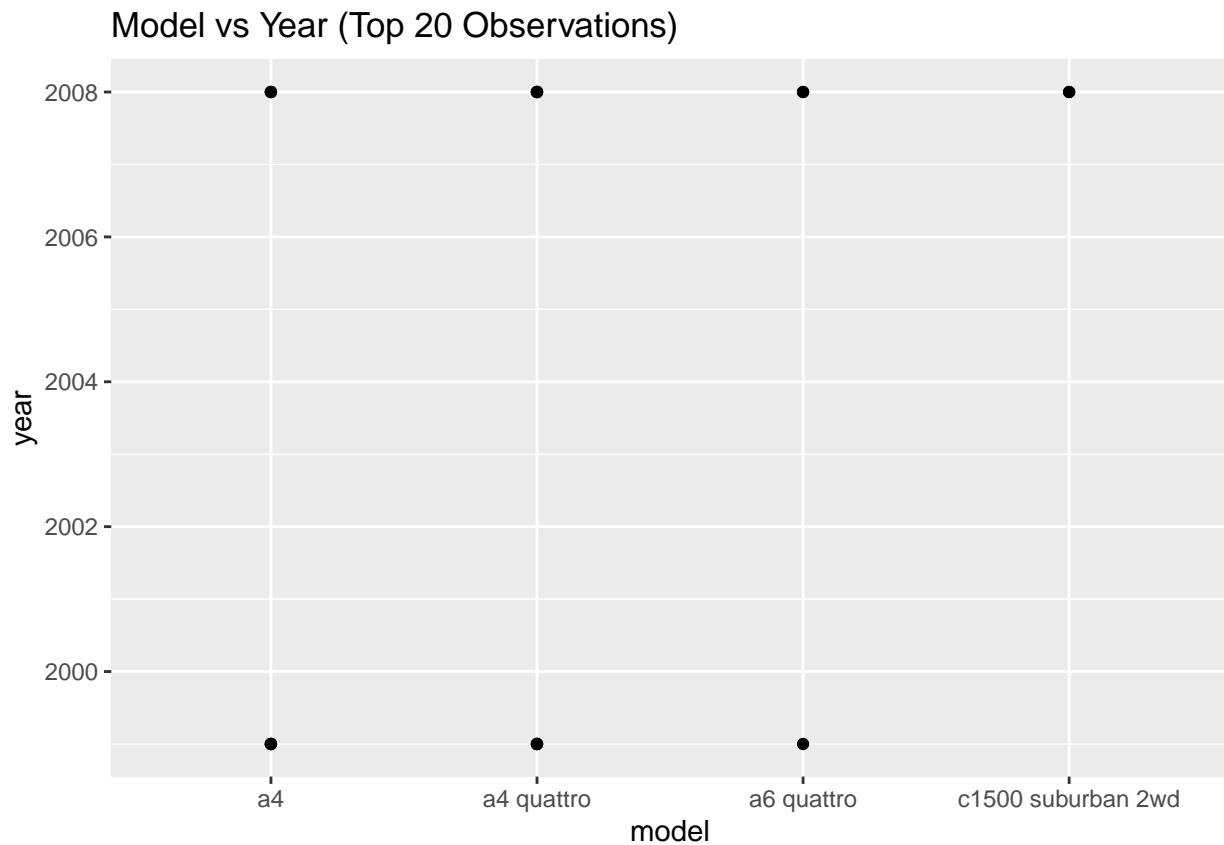


#2b.

#To make it more informative, we need to filter or reorder data to reduce clutter.

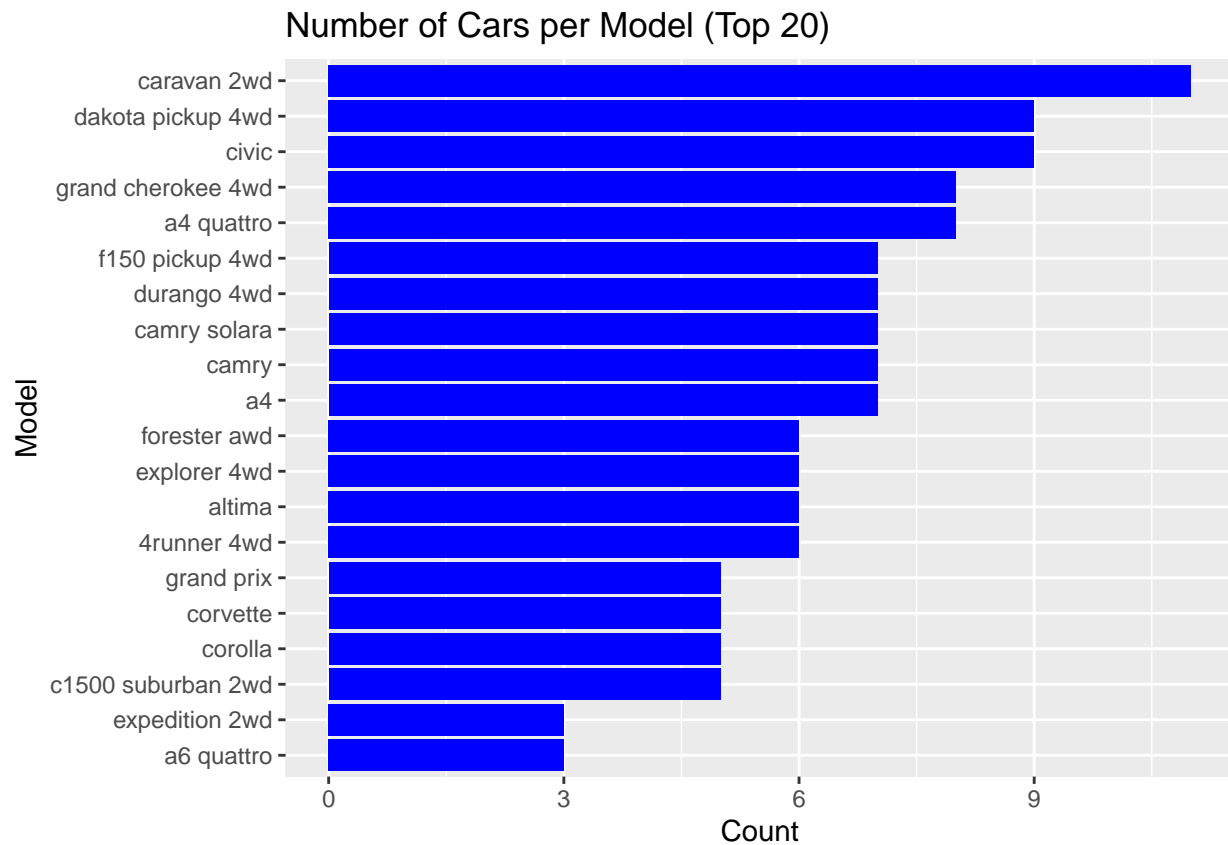
#3a

```
top20 <- head(mpgdata, 20)
ggplot(top20, aes(x = model, y = year)) + geom_point() +
  labs(title = "Model vs Year (Top 20 Observations)")
```



```
#4a.  
mpg_model_count <- mpgdata %>%  
  group_by(model) %>%  
  summarize(count = n())
```

```
#4b.  
library(ggplot2)  
ggplot(head(mpg_model_count, 20), aes(x = reorder(model, count), y = count)) +  
  geom_bar(stat = "identity", fill = "blue") +  
  coord_flip() +  
  labs(title = "Number of Cars per Model (Top 20)", x = "Model", y = "Count")
```



```
#5.
ggplot(mpgdata, 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")
```

