

EDA Learning Activity-1

World University Ranking Dataset

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Introduction

The World University Ranking dataset is a comprehensive collection of information that assesses and ranks higher education institutions globally based on various criteria. This dataset serves as a valuable resource for researchers, educators, and policymakers, offering insights into the comparative performance of universities worldwide. By examining factors such as academic reputation, faculty quality, research output, and international diversity, the dataset provides a nuanced understanding of the educational landscape on a global scale. These rankings play a pivotal role in shaping perspectives on academic excellence, aiding prospective students in making informed decisions about their educational journeys and contributing to discussions on the state of higher education internationally. Analyzing the World University Ranking dataset enables a deeper exploration of trends, patterns, and disparities within the global academic community, fostering a better understanding of the evolving dynamics in the realm of higher education.

```
#read data into a dataframe
df<- read.csv("~/Desktop/cwurData.csv")
#printing the summary of the dataframe
summary(df)
```

```
##      world_rank      institution      country      national_rank
## Min.   : 1.0      Length:2200      Length:2200      Min.   : 1.00
## 1st Qu.: 175.8      Class :character      Class :character      1st Qu.: 6.00
## Median : 450.5      Mode  :character      Mode  :character      Median : 21.00
## Mean   : 459.6
## 3rd Qu.: 725.2
## Max.   :1000.0
##
## quality_of_education alumni_employment quality_of_faculty  publications
## Min.   : 1.0      Min.   : 1.0      Min.   : 1.0      Min.   : 1.0
## 1st Qu.:175.8      1st Qu.:175.8      1st Qu.:175.8      1st Qu.: 175.8
## Median :355.0      Median :450.5      Median :210.0      Median : 450.5
## Mean   :275.1      Mean   :357.1      Mean   :178.9      Mean   : 459.9
## 3rd Qu.:367.0      3rd Qu.:478.0      3rd Qu.:218.0      3rd Qu.: 725.0
## Max.   :367.0      Max.   :567.0      Max.   :218.0      Max.   :1000.0
##
##      influence      citations      broad_impact      patents
## Min.   : 1.0      Min.   : 1.0      Min.   : 1.0      Min.   : 1.0
## 1st Qu.:175.8      1st Qu.:161.0      1st Qu.: 250.5      1st Qu.:170.8
## Median :450.5      Median :406.0      Median : 496.0      Median :426.0
## Mean   :459.8      Mean   :413.4      Mean   : 496.7      Mean   :433.3
## 3rd Qu.:725.2      3rd Qu.:645.0      3rd Qu.: 741.0      3rd Qu.:714.2
## Max.   :991.0      Max.   :812.0      Max.   :1000.0      Max.   :871.0
##
## NA's :200
##      score      year
```

```
## Min. : 43.36 Min. :2012
## 1st Qu.: 44.46 1st Qu.:2014
## Median : 45.10 Median :2014
## Mean : 47.80 Mean :2014
## 3rd Qu.: 47.55 3rd Qu.:2015
## Max. :100.00 Max. :2015
##
```

```
#viewing named objects in the workspace
ls()
```

```
## [1] "df"
```

```
#checking the structure of a data frame
str(df)
```

```
## 'data.frame': 2200 obs. of 14 variables:
## $ world_rank : int 1 2 3 4 5 6 7 8 9 10 ...
## $ institution : chr "Harvard University" "Massachusetts Institute of Technology" "Stanford
## $ country : chr "USA" "USA" "USA" "United Kingdom" ...
## $ national_rank : int 1 2 3 1 4 5 2 6 7 8 ...
## $ quality_of_education: int 7 9 17 10 2 8 13 14 23 16 ...
## $ alumni_employment : int 9 17 11 24 29 14 28 31 21 52 ...
## $ quality_of_faculty : int 1 3 5 4 7 2 9 12 10 6 ...
## $ publications : int 1 12 4 16 37 53 15 14 13 6 ...
## $ influence : int 1 4 2 16 22 33 13 6 12 5 ...
## $ citations : int 1 4 2 11 22 26 19 15 14 3 ...
## $ broad_impact : int NA NA NA NA NA NA NA NA NA NA ...
## $ patents : int 5 1 15 50 18 101 26 66 5 16 ...
## $ score : num 100 91.7 89.5 86.2 85.2 ...
## $ year : int 2012 2012 2012 2012 2012 2012 2012 2012 2012 2012 ...
```

```
#display first few rows of the data frame
head(df)
```

```
## world_rank institution country national_rank
## 1 1 Harvard University USA 1
## 2 2 Massachusetts Institute of Technology USA 2
## 3 3 Stanford University USA 3
## 4 4 University of Cambridge United Kingdom 1
## 5 5 California Institute of Technology USA 4
## 6 6 Princeton University USA 5
## quality_of_education alumni_employment quality_of_faculty publications
## 1 7 9 1 1
## 2 9 17 3 12
## 3 17 11 5 4
## 4 10 24 4 16
## 5 2 29 7 37
## 6 8 14 2 53
## influence citations broad_impact patents score year
## 1 1 1 NA 5 100.00 2012
## 2 4 4 NA 1 91.67 2012
```

```
## 3      2      2      NA      15 89.50 2012
## 4     16     11     NA      50 86.17 2012
## 5     22     22     NA      18 85.21 2012
## 6     33     26     NA     101 82.50 2012
```

```
#accessing a column in a dataframe
df$world_rank
```

```
## [1] 1 2 3 4 5 6 7 8 9 10 11 12 13 14
## [15] 15 16 17 18 19 20 21 22 23 24 25 26 27 28
## [29] 29 30 31 32 33 34 35 36 37 38 39 40 41 42
## [43] 43 44 45 46 47 48 49 50 51 52 53 54 55 56
## [57] 57 58 59 60 61 62 63 64 65 66 67 68 69 70
## [71] 71 72 73 74 75 76 77 78 79 80 81 82 83 84
## [85] 85 86 87 88 89 90 91 92 93 94 95 96 97 98
## [99] 99 100 1 2 3 4 5 6 7 8 9 10 11 12
## [113] 13 14 15 16 17 18 19 20 21 22 23 24 25 26
## [127] 27 28 29 30 31 32 33 34 35 36 37 38 39 40
## [141] 41 42 43 44 45 46 47 48 49 50 51 52 53 54
## [155] 55 56 57 58 59 60 61 62 63 64 65 66 67 68
## [169] 69 70 71 72 73 74 75 76 77 78 79 80 81 82
## [183] 83 84 85 86 87 88 89 90 91 92 93 94 95 96
## [197] 97 98 99 100 1 2 3 4 5 6 7 8 9 10
## [211] 11 12 13 14 15 16 17 18 19 20 21 22 23 24
## [225] 25 26 27 28 29 30 31 32 33 34 35 36 37 38
## [239] 39 40 41 42 43 44 45 46 47 48 49 50 51 52
## [253] 53 54 55 56 57 58 59 60 61 62 63 64 65 66
## [267] 67 68 69 70 71 72 73 74 75 76 77 78 79 80
## [281] 81 82 83 84 85 86 87 88 89 90 91 92 93 94
## [295] 95 96 97 98 99 100 101 102 103 104 105 106 107 108
## [309] 109 110 111 112 113 114 115 116 117 118 119 120 121 122
## [323] 123 124 125 126 127 128 129 130 131 132 133 134 135 136
## [337] 137 138 139 140 141 142 143 144 145 146 147 148 149 150
## [351] 151 152 153 154 155 156 157 158 159 160 161 162 163 164
## [365] 165 166 167 168 169 170 171 172 173 174 175 176 177 178
## [379] 179 180 181 182 183 184 185 186 187 188 189 190 191 192
## [393] 193 194 195 196 197 198 199 200 201 202 203 204 205 206
## [407] 207 208 209 210 211 212 213 214 215 216 217 218 219 220
## [421] 221 222 223 224 225 226 227 228 229 230 231 232 233 234
## [435] 235 236 237 238 239 240 241 242 243 244 245 246 247 248
## [449] 249 250 251 252 253 254 255 256 257 258 259 260 261 262
## [463] 263 264 265 266 267 268 269 270 271 272 273 274 275 276
## [477] 277 278 279 280 281 282 283 284 285 286 287 288 289 290
## [491] 291 292 293 294 295 296 297 298 299 300 301 302 303 304
## [505] 305 306 307 308 309 310 311 312 313 314 315 316 317 318
## [519] 319 320 321 322 323 324 325 326 327 328 329 330 331 332
## [533] 333 334 335 336 337 338 339 340 341 342 343 344 345 346
## [547] 347 348 349 350 351 352 353 354 355 356 357 358 359 360
## [561] 361 362 363 364 365 366 367 368 369 370 371 372 373 374
## [575] 375 376 377 378 379 380 381 382 383 384 385 386 387 388
## [589] 389 390 391 392 393 394 395 396 397 398 399 400 401 402
## [603] 403 404 405 406 407 408 409 410 411 412 413 414 415 416
## [617] 417 418 419 420 421 422 423 424 425 426 427 428 429 430
## [631] 431 432 433 434 435 436 437 438 439 440 441 442 443 444
```

##	[645]	445	446	447	448	449	450	451	452	453	454	455	456	457	458
##	[659]	459	460	461	462	463	464	465	466	467	468	469	470	471	472
##	[673]	473	474	475	476	477	478	479	480	481	482	483	484	485	486
##	[687]	487	488	489	490	491	492	493	494	495	496	497	498	499	500
##	[701]	501	502	503	504	505	506	507	508	509	510	511	512	513	514
##	[715]	515	516	517	518	519	520	521	522	523	524	525	526	527	528
##	[729]	529	530	531	532	533	534	535	536	537	538	539	540	541	542
##	[743]	543	544	545	546	547	548	549	550	551	552	553	554	555	556
##	[757]	557	558	559	560	561	562	563	564	565	566	567	568	569	570
##	[771]	571	572	573	574	575	576	577	578	579	580	581	582	583	584
##	[785]	585	586	587	588	589	590	591	592	593	594	595	596	597	598
##	[799]	599	600	601	602	603	604	605	606	607	608	609	610	611	612
##	[813]	613	614	615	616	617	618	619	620	621	622	623	624	625	626
##	[827]	627	628	629	630	631	632	633	634	635	636	637	638	639	640
##	[841]	641	642	643	644	645	646	647	648	649	650	651	652	653	654
##	[855]	655	656	657	658	659	660	661	662	663	664	665	666	667	668
##	[869]	669	670	671	672	673	674	675	676	677	678	679	680	681	682
##	[883]	683	684	685	686	687	688	689	690	691	692	693	694	695	696
##	[897]	697	698	699	700	701	702	703	704	705	706	707	708	709	710
##	[911]	711	712	713	714	715	716	717	718	719	720	721	722	723	724
##	[925]	725	726	727	728	729	730	731	732	733	734	735	736	737	738
##	[939]	739	740	741	742	743	744	745	746	747	748	749	750	751	752
##	[953]	753	754	755	756	757	758	759	760	761	762	763	764	765	766
##	[967]	767	768	769	770	771	772	773	774	775	776	777	778	779	780
##	[981]	781	782	783	784	785	786	787	788	789	790	791	792	793	794
##	[995]	795	796	797	798	799	800	801	802	803	804	805	806	807	808
##	[1009]	809	810	811	812	813	814	815	816	817	818	819	820	821	822
##	[1023]	823	824	825	826	827	828	829	830	831	832	833	834	835	836
##	[1037]	837	838	839	840	841	842	843	844	845	846	847	848	849	850
##	[1051]	851	852	853	854	855	856	857	858	859	860	861	862	863	864
##	[1065]	865	866	867	868	869	870	871	872	873	874	875	876	877	878
##	[1079]	879	880	881	882	883	884	885	886	887	888	889	890	891	892
##	[1093]	893	894	895	896	897	898	899	900	901	902	903	904	905	906
##	[1107]	907	908	909	910	911	912	913	914	915	916	917	918	919	920
##	[1121]	921	922	923	924	925	926	927	928	929	930	931	932	933	934
##	[1135]	935	936	937	938	939	940	941	942	943	944	945	946	947	948
##	[1149]	949	950	951	952	953	954	955	956	957	958	959	960	961	962
##	[1163]	963	964	965	966	967	968	969	970	971	972	973	974	975	976
##	[1177]	977	978	979	980	981	982	983	984	985	986	987	988	989	990
##	[1191]	991	992	993	994	995	996	997	998	999	1000	1	2	3	4
##	[1205]	5	6	7	8	9	10	11	12	13	14	15	16	17	18
##	[1219]	19	20	21	22	23	24	25	26	27	28	29	30	31	32
##	[1233]	33	34	35	36	37	38	39	40	41	42	43	44	45	46
##	[1247]	47	48	49	50	51	52	53	54	55	56	57	58	59	60
##	[1261]	61	62	63	64	65	66	67	68	69	70	71	72	73	74
##	[1275]	75	76	77	78	79	80	81	82	83	84	85	86	87	88
##	[1289]	89	90	91	92	93	94	95	96	97	98	99	100	101	102
##	[1303]	103	104	105	106	107	108	109	110	111	112	113	114	115	116
##	[1317]	117	118	119	120	121	122	123	124	125	126	127	128	129	130
##	[1331]	131	132	133	134	135	136	137	138	139	140	141	142	143	144
##	[1345]	145	146	147	148	149	150	151	152	153	154	155	156	157	158
##	[1359]	159	160	161	162	163	164	165	166	167	168	169	170	171	172
##	[1373]	173	174	175	176	177	178	179	180	181	182	183	184	185	186
##	[1387]	187	188	189	190	191	192	193	194	195	196	197	198	199	200

##	[1401]	201	202	203	204	205	206	207	208	209	210	211	212	213	214
##	[1415]	215	216	217	218	219	220	221	222	223	224	225	226	227	228
##	[1429]	229	230	231	232	233	234	235	236	237	238	239	240	241	242
##	[1443]	243	244	245	246	247	248	249	250	251	252	253	254	255	256
##	[1457]	257	258	259	260	261	262	263	264	265	266	267	268	269	270
##	[1471]	271	272	273	274	275	276	277	278	279	280	281	282	283	284
##	[1485]	285	286	287	288	289	290	291	292	293	294	295	296	297	298
##	[1499]	299	300	301	302	303	304	305	306	307	308	309	310	311	312
##	[1513]	313	314	315	316	317	318	319	320	321	322	323	324	325	326
##	[1527]	327	328	329	330	331	332	333	334	335	336	337	338	339	340
##	[1541]	341	342	343	344	345	346	347	348	349	350	351	352	353	354
##	[1555]	355	356	357	358	359	360	361	362	363	364	365	366	367	368
##	[1569]	369	370	371	372	373	374	375	376	377	378	379	380	381	382
##	[1583]	383	384	385	386	387	388	389	390	391	392	393	394	395	396
##	[1597]	397	398	399	400	401	402	403	404	405	406	407	408	409	410
##	[1611]	411	412	413	414	415	416	417	418	419	420	421	422	423	424
##	[1625]	425	426	427	428	429	430	431	432	433	434	435	436	437	438
##	[1639]	439	440	441	442	443	444	445	446	447	448	449	450	451	452
##	[1653]	453	454	455	456	457	458	459	460	461	462	463	464	465	466
##	[1667]	467	468	469	470	471	472	473	474	475	476	477	478	479	480
##	[1681]	481	482	483	484	485	486	487	488	489	490	491	492	493	494
##	[1695]	495	496	497	498	499	500	501	502	503	504	505	506	507	508
##	[1709]	509	510	511	512	513	514	515	516	517	518	519	520	521	522
##	[1723]	523	524	525	526	527	528	529	530	531	532	533	534	535	536
##	[1737]	537	538	539	540	541	542	543	544	545	546	547	548	549	550
##	[1751]	551	552	553	554	555	556	557	558	559	560	561	562	563	564
##	[1765]	565	566	567	568	569	570	571	572	573	574	575	576	577	578
##	[1779]	579	580	581	582	583	584	585	586	587	588	589	590	591	592
##	[1793]	593	594	595	596	597	598	599	600	601	602	603	604	605	606
##	[1807]	607	608	609	610	611	612	613	614	615	616	617	618	619	620
##	[1821]	621	622	623	624	625	626	627	628	629	630	631	632	633	634
##	[1835]	635	636	637	638	639	640	641	642	643	644	645	646	647	648
##	[1849]	649	650	651	652	653	654	655	656	657	658	659	660	661	662
##	[1863]	663	664	665	666	667	668	669	670	671	672	673	674	675	676
##	[1877]	677	678	679	680	681	682	683	684	685	686	687	688	689	690
##	[1891]	691	692	693	694	695	696	697	698	699	700	701	702	703	704
##	[1905]	705	706	707	708	709	710	711	712	713	714	715	716	717	718
##	[1919]	719	720	721	722	723	724	725	726	727	728	729	730	731	732
##	[1933]	733	734	735	736	737	738	739	740	741	742	743	744	745	746
##	[1947]	747	748	749	750	751	752	753	754	755	756	757	758	759	760
##	[1961]	761	762	763	764	765	766	767	768	769	770	771	772	773	774
##	[1975]	775	776	777	778	779	780	781	782	783	784	785	786	787	788
##	[1989]	789	790	791	792	793	794	795	796	797	798	799	800	801	802
##	[2003]	803	804	805	806	807	808	809	810	811	812	813	814	815	816
##	[2017]	817	818	819	820	821	822	823	824	825	826	827	828	829	830
##	[2031]	831	832	833	834	835	836	837	838	839	840	841	842	843	844
##	[2045]	845	846	847	848	849	850	851	852	853	854	855	856	857	858
##	[2059]	859	860	861	862	863	864	865	866	867	868	869	870	871	872
##	[2073]	873	874	875	876	877	878	879	880	881	882	883	884	885	886
##	[2087]	887	888	889	890	891	892	893	894	895	896	897	898	899	900
##	[2101]	901	902	903	904	905	906	907	908	909	910	911	912	913	914
##	[2115]	915	916	917	918	919	920	921	922	923	924	925	926	927	928
##	[2129]	929	930	931	932	933	934	935	936	937	938	939	940	941	942
##	[2143]	943	944	945	946	947	948	949	950	951	952	953	954	955	956

```
## [2157] 957 958 959 960 961 962 963 964 965 966 967 968 969 970
## [2171] 971 972 973 974 975 976 977 978 979 980 981 982 983 984
## [2185] 985 986 987 988 989 990 991 992 993 994 995 996 997 998
## [2199] 999 1000
```

```
# Retrieves the names of all the columns present in the dataset
names(df)
```

```
## [1] "world_rank"      "institution"      "country"
## [4] "national_rank"   "quality_of_education" "alumni_employment"
## [7] "quality_of_faculty" "publications"     "influence"
## [10] "citations"       "broad_impact"     "patents"
## [13] "score"           "year"
```

```
#Calculate mean of a specific column
mean(df$world_rank)
```

```
## [1] 459.5909
```

```
#checking data type of a column
class(df$country)
```

```
## [1] "character"
```

```
# Create a subset of data frame where World rank is less than 25
subset_df <- df[df$world_rank < 10, ]
subset_df
```

```
##      world_rank      institution      country
## 1             1      Harvard University      USA
## 2             2 Massachusetts Institute of Technology      USA
## 3             3      Stanford University      USA
## 4             4      University of Cambridge United Kingdom
## 5             5      California Institute of Technology      USA
## 6             6      Princeton University      USA
## 7             7      University of Oxford United Kingdom
## 8             8      Yale University      USA
## 9             9      Columbia University      USA
## 101           1      Harvard University      USA
## 102           2      Stanford University      USA
## 103           3      University of Oxford United Kingdom
## 104           4 Massachusetts Institute of Technology      USA
## 105           5      University of Cambridge United Kingdom
## 106           6      Columbia University      USA
## 107           7      University of California, Berkeley      USA
## 108           8      Princeton University      USA
## 109           9      University of Chicago      USA
## 201           1      Harvard University      USA
## 202           2      Stanford University      USA
## 203           3 Massachusetts Institute of Technology      USA
## 204           4      University of Cambridge United Kingdom
```

## 205	5	University of Oxford	United Kingdom				
## 206	6	Columbia University	USA				
## 207	7	University of California, Berkeley	USA				
## 208	8	University of Chicago	USA				
## 209	9	Princeton University	USA				
## 1201	1	Harvard University	USA				
## 1202	2	Stanford University	USA				
## 1203	3	Massachusetts Institute of Technology	USA				
## 1204	4	University of Cambridge	United Kingdom				
## 1205	5	University of Oxford	United Kingdom				
## 1206	6	Columbia University	USA				
## 1207	7	University of California, Berkeley	USA				
## 1208	8	University of Chicago	USA				
## 1209	9	Princeton University	USA				
##	national_rank	quality_of_education	alumni_employment	quality_of_faculty			
## 1	1	7	9	1			
## 2	2	9	17	3			
## 3	3	17	11	5			
## 4	1	10	24	4			
## 5	4	2	29	7			
## 6	5	8	14	2			
## 7	2	13	28	9			
## 8	6	14	31	12			
## 9	7	23	21	10			
## 101	1	1	1	1			
## 102	2	11	2	4			
## 103	1	7	12	10			
## 104	3	2	16	2			
## 105	2	3	15	5			
## 106	4	13	8	9			
## 107	5	6	28	6			
## 108	6	4	14	3			
## 109	7	9	19	8			
## 201	1	1	1	1			
## 202	2	11	2	4			
## 203	3	3	11	2			
## 204	1	2	10	5			
## 205	2	7	12	10			
## 206	4	13	8	9			
## 207	5	4	22	6			
## 208	6	10	14	8			
## 209	7	5	16	3			
## 1201	1	1	1	1			
## 1202	2	9	2	4			
## 1203	3	3	11	2			
## 1204	1	2	10	5			
## 1205	2	7	13	10			
## 1206	4	13	6	9			
## 1207	5	5	21	6			
## 1208	6	11	14	8			
## 1209	7	4	15	3			
##	publications	influence	citations	broad_impact	patents	score	year
## 1	1	1	1	NA	5	100.00	2012
## 2	12	4	4	NA	1	91.67	2012

```
## 3      4      2      2      NA      15 89.50 2012
## 4     16     16     11     NA      50 86.17 2012
## 5     37     22     22     NA      18 85.21 2012
## 6     53     33     26     NA     101 82.50 2012
## 7     15     13     19     NA      26 82.34 2012
## 8     14      6     15     NA      66 79.14 2012
## 9     13     12     14     NA       5 78.86 2012
## 101     1      1      1     NA       7 100.00 2013
## 102     6      2      2     NA      11 93.94 2013
## 103     11     7     13     NA      15 92.54 2013
## 104     16      3      3     NA       1 91.45 2013
## 105      9     11     10     NA      39 90.24 2013
## 106     13      9     11     NA      10 88.21 2013
## 107      8      6      4     NA      19 85.07 2013
## 108     58     35     27     NA     101 82.17 2013
## 109     37     21     30     NA     101 79.16 2013
## 201      1      1      1      1       2 100.00 2014
## 202      5      3      3      4       6 99.09 2014
## 203     15      2      2      2       1 98.69 2014
## 204     10      9     12     13      48 97.64 2014
## 205     11     12     11     12      16 97.51 2014
## 206     14     13      9     13       4 97.41 2014
## 207      7      4      3      7      28 92.84 2014
## 208     17     19     10     18     149 92.03 2014
## 209     70     25     19     41     204 88.56 2014
## 1201      1      1      1      1       3 100.00 2015
## 1202      5      3      3      4      10 98.66 2015
## 1203     15      2      2      2       1 97.54 2015
## 1204     11      6     12     13      48 96.81 2015
## 1205      7     12      7      9      15 96.46 2015
## 1206     13     13     11     12       4 96.14 2015
## 1207     10      4      4      7      29 92.25 2015
## 1208     17     16     12     22     141 90.70 2015
## 1209     72     25     24     33     225 89.42 2015
```

```
# Add a new column "Gender" to the data frame
df$Gender <- c("F", "M", "M", "M", "F")
```

```
# Remove the "Patents" column from the data frame
df$Patents <- NULL
summary(df)
```

```
##      world_rank      institution      country      national_rank
## Min.   : 1.0      Length:2200      Length:2200      Min.   : 1.00
## 1st Qu.: 175.8    Class :character    Class :character    1st Qu.: 6.00
## Median : 450.5    Mode  :character    Mode  :character    Median : 21.00
## Mean   : 459.6
## 3rd Qu.: 725.2
## Max.   :1000.0
##
## quality_of_education alumni_employment quality_of_faculty publications
## Min.   : 1.0      Min.   : 1.0      Min.   : 1.0      Min.   : 1.0
## 1st Qu.:175.8      1st Qu.:175.8      1st Qu.:175.8      1st Qu.: 175.8
```



```
## Median :355.0      Median :450.5      Median :210.0      Median : 450.5
## Mean   :275.1      Mean    :357.1      Mean    :178.9      Mean    : 459.9
## 3rd Qu.:367.0      3rd Qu.:478.0      3rd Qu.:218.0      3rd Qu.: 725.0
## Max.   :367.0      Max.    :567.0      Max.    :218.0      Max.    :1000.0
##
##      influence      citations      broad_impact      patents
## Min.   : 1.0      Min.   : 1.0      Min.   : 1.0      Min.   : 1.0
## 1st Qu.:175.8      1st Qu.:161.0      1st Qu.: 250.5      1st Qu.:170.8
## Median :450.5      Median :406.0      Median : 496.0      Median :426.0
## Mean   :459.8      Mean    :413.4      Mean    : 496.7      Mean    :433.3
## 3rd Qu.:725.2      3rd Qu.:645.0      3rd Qu.: 741.0      3rd Qu.:714.2
## Max.   :991.0      Max.    :812.0      Max.    :1000.0      Max.    :871.0
##
##                      NA's      :200
##      score      year      Gender
## Min.   : 43.36      Min.   :2012      Length:2200
## 1st Qu.: 44.46      1st Qu.:2014      Class :character
## Median : 45.10      Median :2014      Mode  :character
## Mean   : 47.80      Mean    :2014
## 3rd Qu.: 47.55      3rd Qu.:2015
## Max.   :100.00      Max.    :2015
##
```

```
# Rename the "Score" column to "Points"
names(df)[names(df) == "score"] <- "points"
summary(df)
```

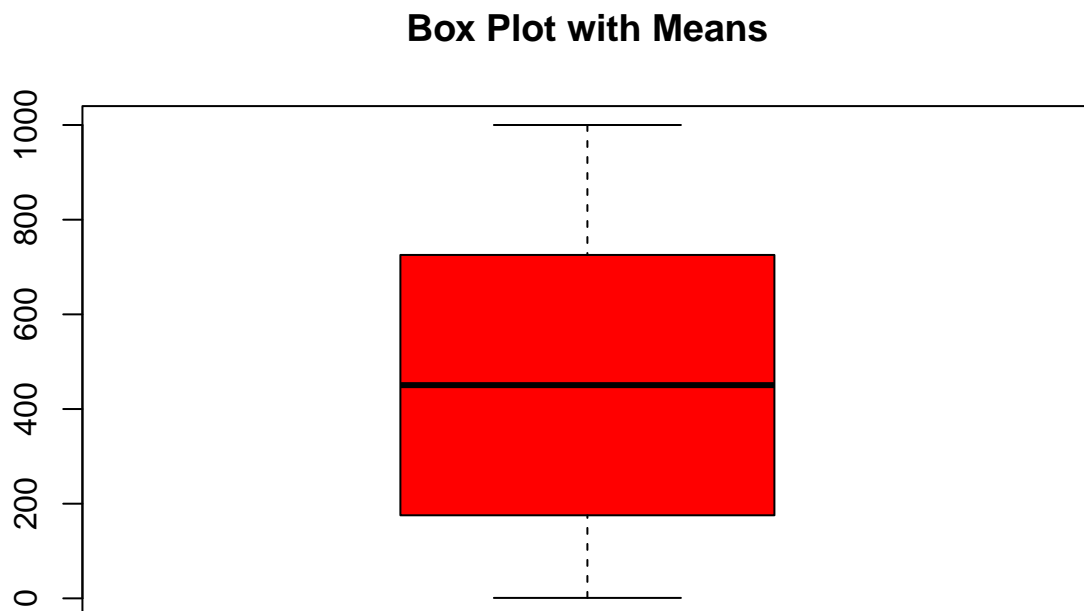
```
##      world_rank      institution      country      national_rank
## Min.   : 1.0      Length:2200      Length:2200      Min.   : 1.00
## 1st Qu.:175.8      Class :character      Class :character      1st Qu.: 6.00
## Median :450.5      Mode  :character      Mode  :character      Median :21.00
## Mean   :459.6
## 3rd Qu.:725.2
## Max.   :1000.0
##
##      quality_of_education      alumni_employment      quality_of_faculty      publications
## Min.   : 1.0      Min.   : 1.0      Min.   : 1.0      Min.   : 1.0
## 1st Qu.:175.8      1st Qu.:175.8      1st Qu.:175.8      1st Qu.:175.8
## Median :355.0      Median :450.5      Median :210.0      Median :450.5
## Mean   :275.1      Mean    :357.1      Mean    :178.9      Mean    :459.9
## 3rd Qu.:367.0      3rd Qu.:478.0      3rd Qu.:218.0      3rd Qu.:725.0
## Max.   :367.0      Max.    :567.0      Max.    :218.0      Max.    :1000.0
##
##      influence      citations      broad_impact      patents
## Min.   : 1.0      Min.   : 1.0      Min.   : 1.0      Min.   : 1.0
## 1st Qu.:175.8      1st Qu.:161.0      1st Qu.: 250.5      1st Qu.:170.8
## Median :450.5      Median :406.0      Median : 496.0      Median :426.0
## Mean   :459.8      Mean    :413.4      Mean    : 496.7      Mean    :433.3
## 3rd Qu.:725.2      3rd Qu.:645.0      3rd Qu.: 741.0      3rd Qu.:714.2
## Max.   :991.0      Max.    :812.0      Max.    :1000.0      Max.    :871.0
##
##                      NA's      :200
##      points      year      Gender
## Min.   : 43.36      Min.   :2012      Length:2200
## 1st Qu.: 44.46      1st Qu.:2014      Class :character
## Median : 45.10      Median :2014      Mode  :character
```

```
## Mean : 47.80 Mean :2014
## 3rd Qu.: 47.55 3rd Qu.:2015
## Max. :100.00 Max. :2015
##
```

```
# Assuming "Gender" is a factor column, change level names
levels(df$Gender) <- c("Male", "Female")
str(df$Gender)
```

```
## chr [1:2200] "F" "M" "M" "M" "F" "F" "M" "M" "M" "F" "F" "M" "M" "M" "F" ...
## - attr(*, "levels")= chr [1:2] "Male" "Female"
```

```
# Adding Means to a Box Plot
boxplot(df$world_rank, mean = TRUE, col = "red", main = "Box Plot with Means")
```

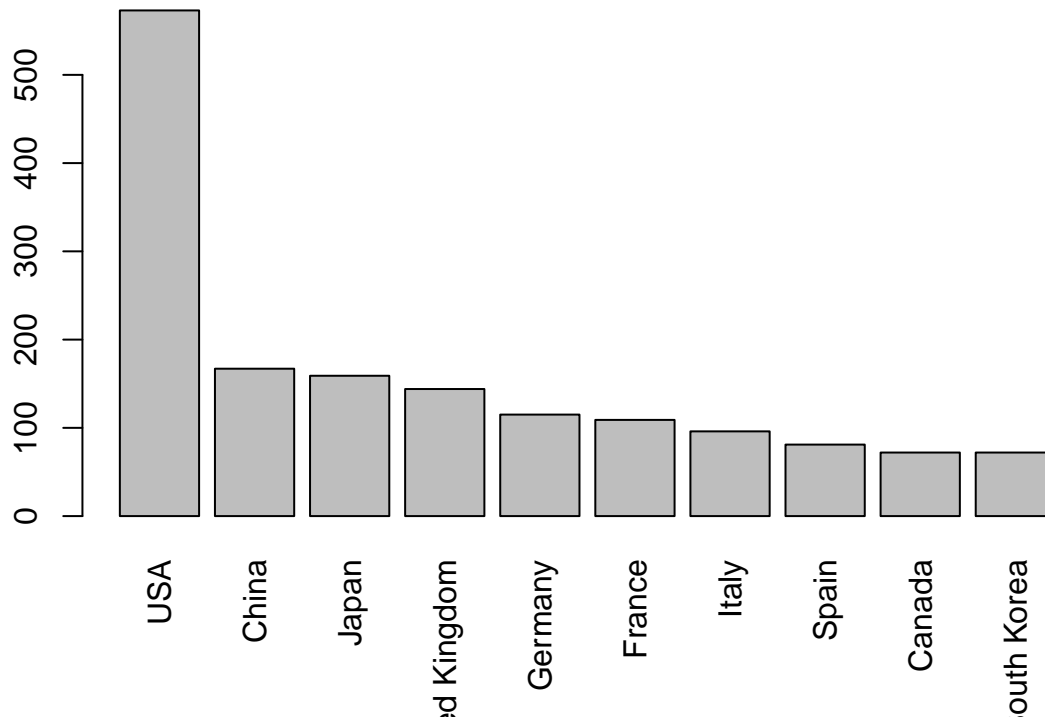


```
#Visualizing the Top Countries in Higher Learning
```

```
height<- sort(table(df$country), decreasing = TRUE)
```

```
barplot(height[1:10], las = 3, main = "Top Countries in University Rankings 2015")
```

Top Countries in University Rankings 2015



```
#Calculates the standard deviation a dataset  
sd(df$national_rank)
```

```
## [1] 51.74087
```

```
#Building a subset dataframe that contains information about only the schools of USA  
usa <- subset(df, df$country == "USA")
```

Analysis

Looking at the data, it is clear that national ranking is determined by multiple factors. To determine how different factors correlate with National rank, we first begin by visualizing National Rank against different variables.

I chose these three variables for comparison.

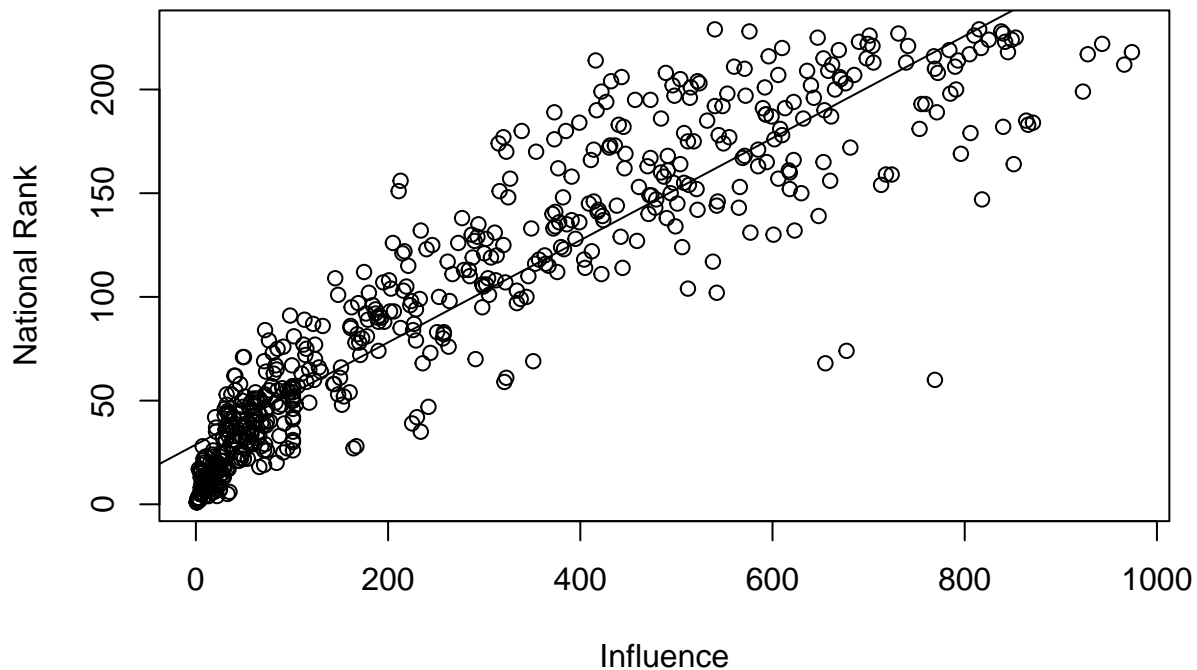
1. Quality of Faculty
2. Influence
3. Citations

```
#To determine how different factors correlate with National rank, we begin by visualizing
```

```
#National Rank against the influence variable.
```

```
plot (usa$influence, usa$national_rank, xlab="Influence", ylab="National Rank", main = "Influence vs National Rank")  
c <- lm(national_rank ~ influence, data = usa)  
abline(c)
```

Influence vs National Rank



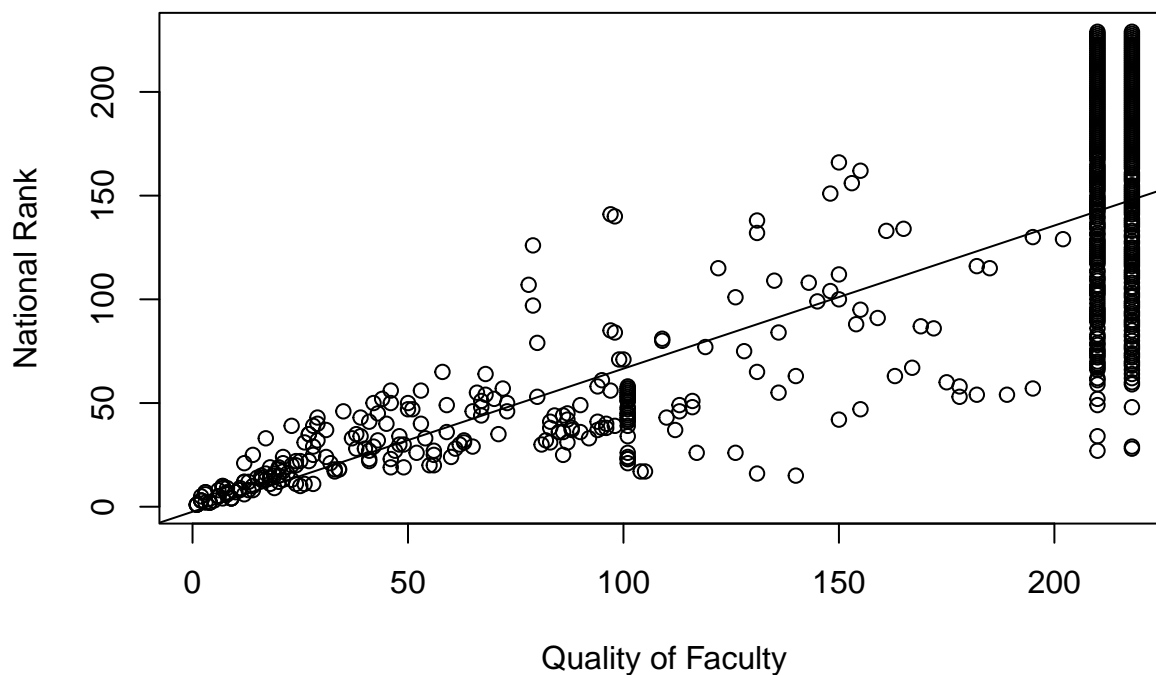
```
summary(c) #regression model
```

```
##
## Call:
## lm(formula = national_rank ~ influence, data = usa)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -158.197  -16.764   -0.922   15.220   82.746
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  28.793900   1.689222   17.05  <2e-16 ***
## influence     0.246298   0.004449   55.36  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 27.3 on 571 degrees of freedom
## Multiple R-squared:  0.843, Adjusted R-squared:  0.8427
## F-statistic: 3065 on 1 and 571 DF, p-value: < 2.2e-16
```

#To determine how different factors correlate with National rank, we then visualize National Rank against the quality of faculty variable.

```
plot(usa$quality_of_faculty, usa$national_rank, xlab = "Quality of Faculty", ylab = "National Rank", main = "Quality of Faculty vs National Rank")
c <- lm(national_rank ~ quality_of_faculty, data = usa)
abline(c)
```

Quality of Faculty vs National Rank

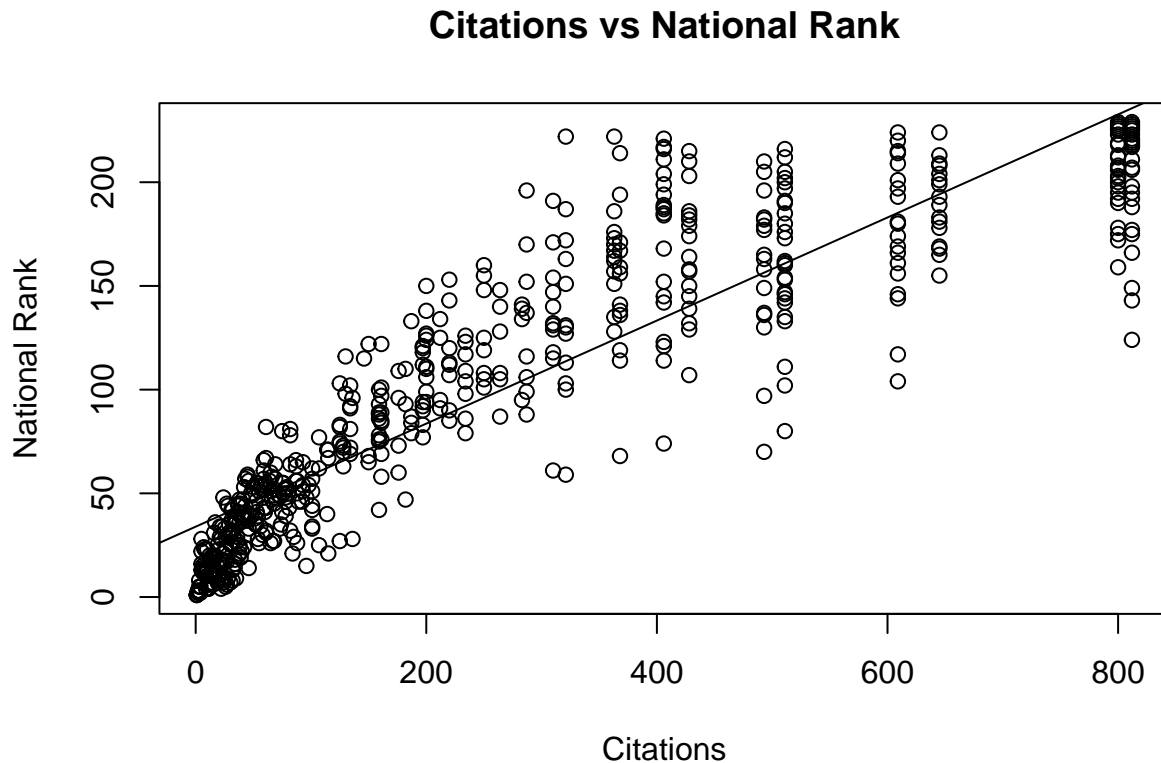


```
summary(c) #regression model
```

```
##
## Call:
## lm(formula = national_rank ~ quality_of_faculty, data = usa)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -119.998  -23.826    2.042   23.002   86.521
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -2.40754    3.51066  -0.686   0.493
## quality_of_faculty  0.68993    0.02115  32.623 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 40.7 on 571 degrees of freedom
## Multiple R-squared:  0.6508, Adjusted R-squared:  0.6502
## F-statistic: 1064 on 1 and 571 DF, p-value: < 2.2e-16
```

*#To determine how different factors correlate with National rank, we then visualize National Rank
#against the citations variable.*

```
plot(usa$citations, usa$national_rank, xlab = "Citations", ylab = "National Rank", main = "Citations vs  
c <- lm(national_rank ~ citations, data = usa)  
abline(c)
```



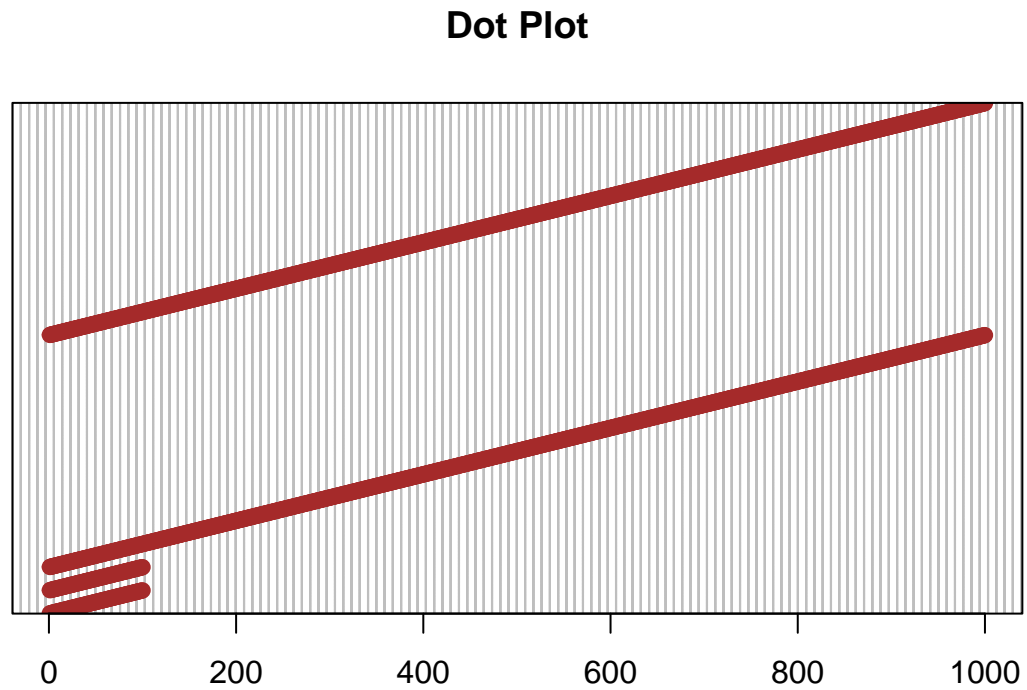
```
summary(c) #regression model
```

```
##  
## Call:  
## lm(formula = national_rank ~ citations, data = usa)  
##  
## Residuals:  
##      Min       1Q   Median       3Q      Max   
## -111.66  -20.41   -4.23   16.74  108.32   
##  
## Coefficients:  
##              Estimate Std. Error t value Pr(>|t|)      
## (Intercept) 33.926097   1.843120   18.41  <2e-16 ***  
## citations    0.248446   0.005161   48.14  <2e-16 ***  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
##  
## Residual standard error: 30.63 on 571 degrees of freedom  
## Multiple R-squared:  0.8023, Adjusted R-squared:  0.802
```

```
## F-statistic: 2317 on 1 and 571 DF, p-value: < 2.2e-16
```

```
# Making a Dot Plot of World_Rank column
```

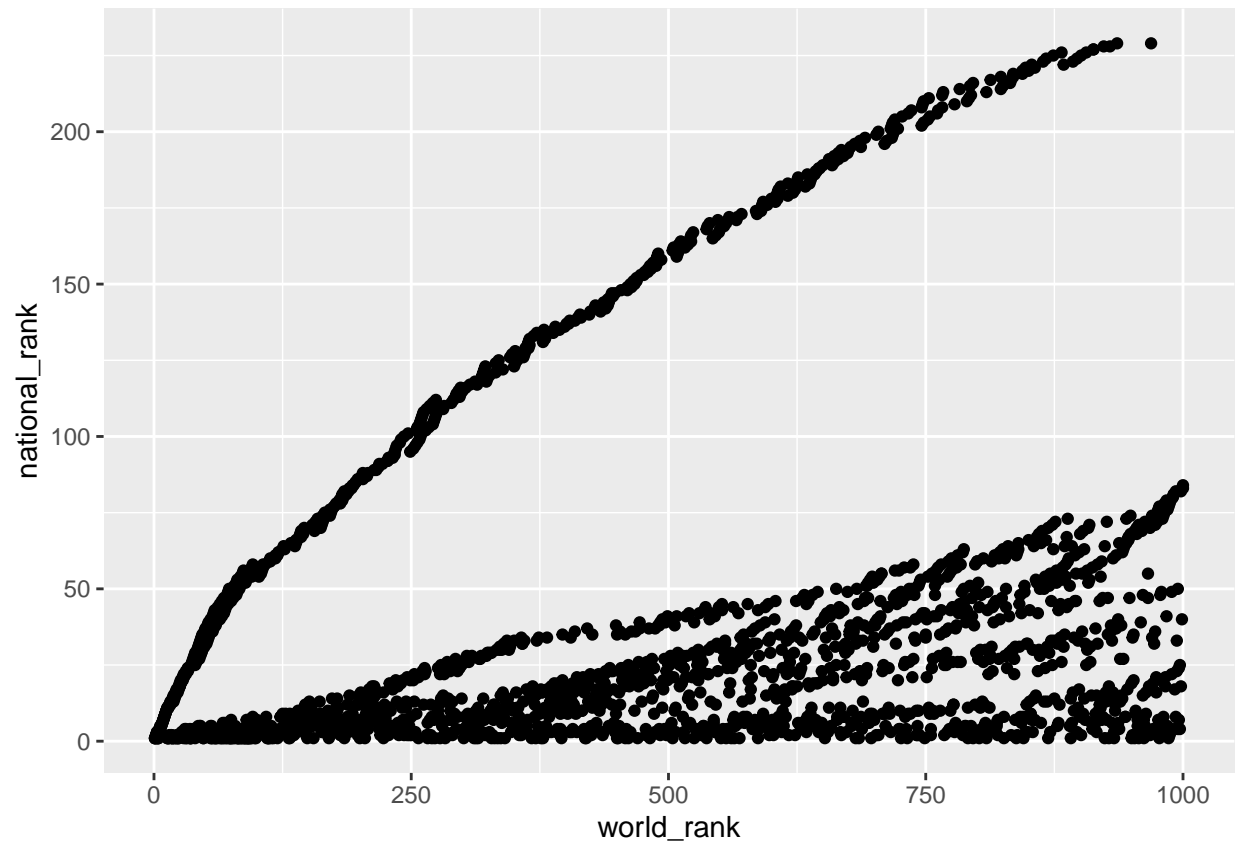
```
dotchart(df$world_rank, pch = 19, col = "brown", main = "Dot Plot")
```



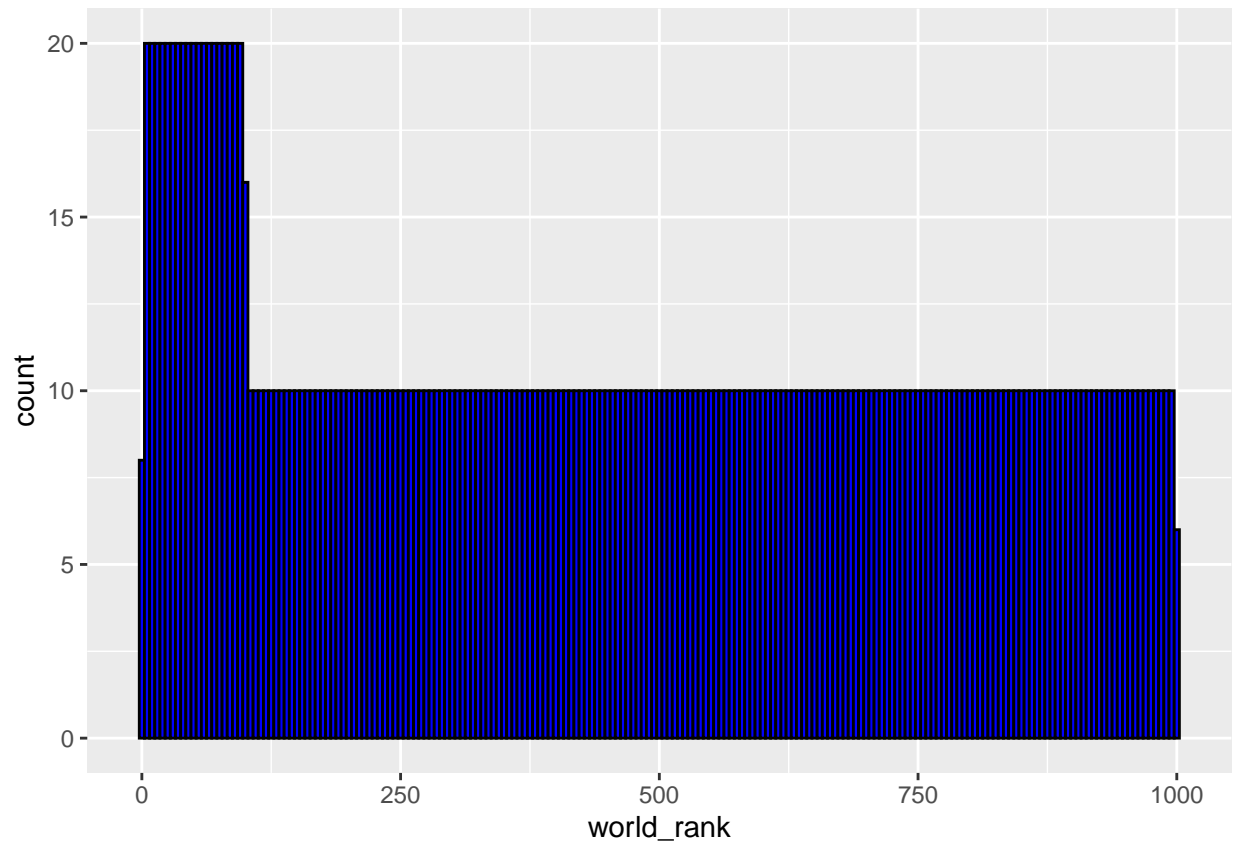
```
# Creating a Scatter Plot for world rank vs national rank
```

```
library(ggplot2)
```

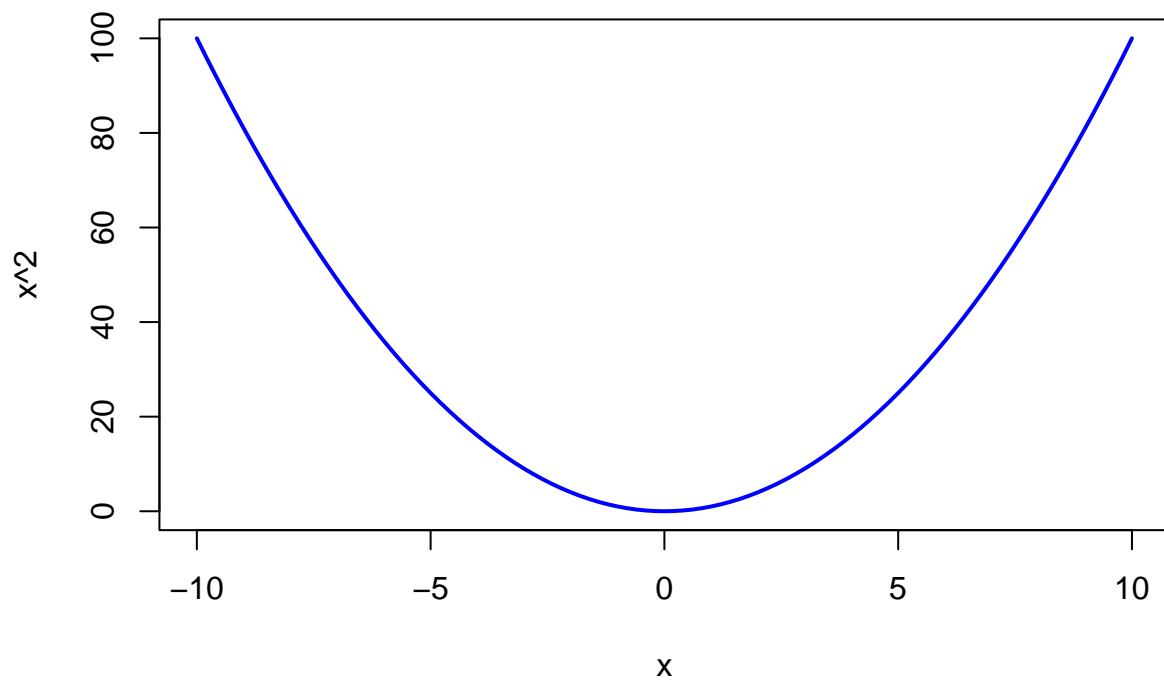
```
ggplot(df, aes(x = world_rank, y = national_rank)) + geom_point()
```



```
# Creating a Histogram for the world_rank column  
ggplot(df, aes(x = world_rank)) + geom_histogram(binwidth = 5, fill = "blue", color = "black")
```

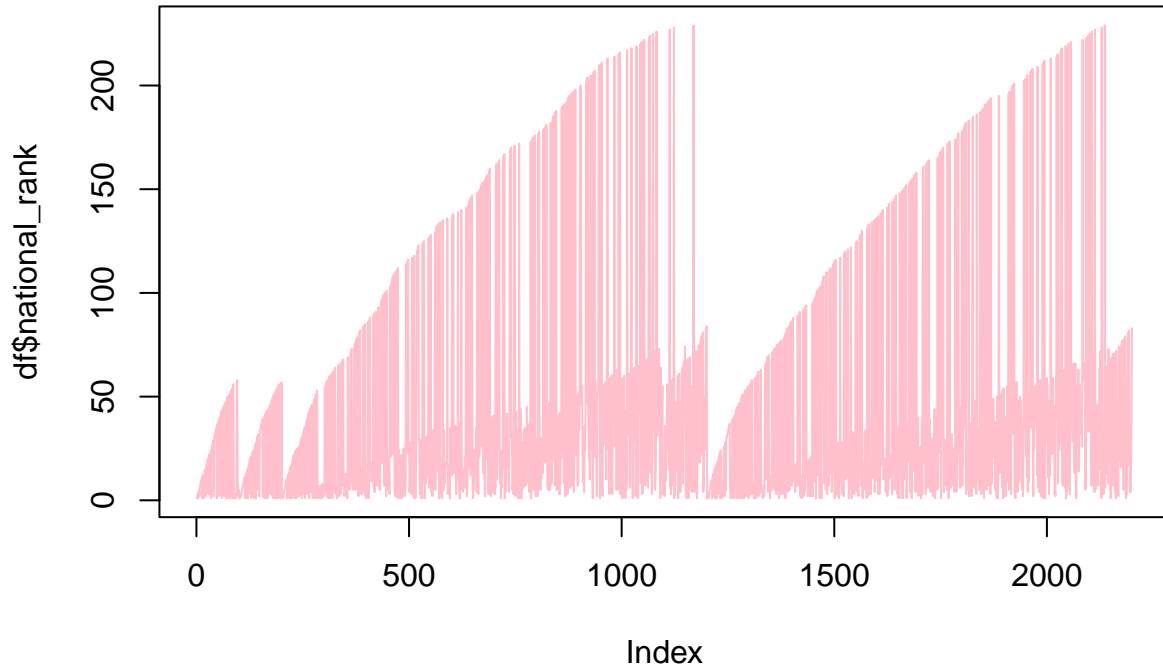



```
# Plotting a Function Curve for the given dataset  
curve(x^2, from = -10, to = 10, col = "blue", lwd = 2)
```



```
# Making a Frequency Polygon for the national_rank column  
plot(df$national_rank, type = "l", lty = 1, col = "pink", main = "Frequency Polygon")
```

Frequency Polygon



```
#converting data type
as.numeric(df$broadcast)
```

```
##      [1]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##     [15]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##     [29]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##     [43]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##     [57]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##     [71]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##     [85]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##     [99]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##    [113]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##    [127]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##    [141]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##    [155]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##    [169]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##    [183]  NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA   NA
##    [197]  NA   NA   NA   NA    1    4    2   13   12   13    7   18   41   19
##    [211]  23   24   26   10    6   51   31   86    3   16   10  151   27  107
##    [225]  28   15    9   68   74   21    8    5   51  266  311  295   62  137
##    [239]  17  380   89   32   56  132   22   33   37  361   29  102   54  121
##    [253]  24  144  155   46   50   19   63   56   41   94   77  238  215   34
##    [267]  37   66   59   46   40  112   36  102   79   73   70   37   34   51
##    [281]  97   48  101   81   56  151  162   49   54   77  145  207  124   59
##    [295]  94  180   81  145   97  326   45   70   99   30  137  145  251  121
##    [309] 207   74  100  106  195  472  102   70   66  211   90   88   41   68
```

##	[323]	110	102	110	118	79	306	81	293	162	192	61	64	137	129
##	[337]	92	114	158	107	81	135	44	86	126	129	135	251	164	437
##	[351]	151	176	318	141	118	121	81	90	117	196	124	355	107	74
##	[365]	64	132	917	112	196	173	628	94	164	415	92	224	129	145
##	[379]	132	203	114	176	114	126	137	295	185	251	230	306	160	155
##	[393]	118	128	234	234	238	339	161	201	155	203	234	295	192	290
##	[407]	247	201	189	180	189	141	145	141	249	176	288	185	169	249
##	[421]	207	169	173	215	176	200	224	238	164	196	151	158	185	215
##	[435]	203	322	211	230	145	189	196	472	272	192	173	395	277	220
##	[449]	164	164	169	184	220	224	220	180	169	523	220	180	266	211
##	[463]	185	230	238	261	274	230	251	266	281	238	251	215	245	224
##	[477]	281	256	266	306	322	207	585	272	756	277	355	256	215	349
##	[491]	295	313	203	569	211	295	372	266	224	346	261	274	234	265
##	[505]	245	596	832	266	261	238	504	224	256	420	819	295	256	375
##	[519]	346	277	247	295	281	326	261	281	420	756	402	274	306	386
##	[533]	238	543	337	295	326	277	749	313	281	295	293	288	256	281
##	[547]	523	341	361	318	339	290	334	472	313	386	322	311	281	318
##	[561]	523	386	318	596	472	349	295	290	355	690	430	409	295	452
##	[575]	343	306	313	349	334	569	395	326	488	523	504	343	313	326
##	[589]	504	355	326	460	341	663	337	724	769	409	642	430	380	442
##	[603]	322	366	326	618	380	504	420	514	442	514	402	326	415	749
##	[617]	514	386	402	897	355	543	334	420	361	343	420	889	618	370
##	[631]	355	361	346	415	395	769	386	420	430	496	361	349	642	504
##	[645]	366	349	663	488	380	395	409	349	442	375	372	366	437	430
##	[659]	554	380	460	395	420	554	596	370	386	395	452	372	442	460
##	[673]	395	430	496	402	482	386	375	460	380	596	442	366	472	409
##	[687]	628	628	716	375	375	769	460	874	430	514	452	514	569	420
##	[701]	472	420	482	739	402	488	605	409	386	402	386	437	979	554
##	[715]	472	409	415	437	724	488	402	442	923	531	460	430	675	496
##	[729]	724	420	482	460	415	452	724	452	536	783	642	472	442	460
##	[743]	569	819	452	442	437	585	460	442	442	504	605	452	531	496
##	[757]	452	460	488	800	849	482	642	460	523	496	472	663	724	642
##	[771]	496	488	703	703	460	756	514	472	642	514	554	482	488	724
##	[785]	514	496	889	569	488	482	531	523	543	675	536	642	504	496
##	[799]	897	531	897	554	585	504	523	675	675	531	716	504	554	543
##	[813]	536	716	569	504	536	514	585	569	523	675	605	569	569	536
##	[827]	554	569	628	536	554	543	543	605	642	585	819	569	769	543
##	[841]	554	569	543	703	536	543	554	663	756	554	605	596	909	569
##	[855]	554	543	554	585	628	675	703	543	569	596	675	618	756	989
##	[869]	554	739	628	663	585	554	596	569	628	585	642	585	605	663
##	[883]	690	690	749	569	663	605	585	675	618	618	663	585	605	897
##	[897]	690	596	703	663	596	642	690	869	628	605	739	605	703	843
##	[911]	605	618	642	628	769	724	628	690	605	703	605	642	819	618
##	[925]	628	618	832	618	663	690	690	628	618	675	716	739	642	739
##	[939]	628	675	703	642	716	663	628	769	675	642	769	642	642	663
##	[953]	756	642	756	642	819	690	642	642	909	675	675	675	675	769
##	[967]	724	800	756	690	690	690	769	703	874	874	703	979	724	832
##	[981]	800	756	690	724	703	783	897	739	716	897	739	783	756	703
##	[995]	724	724	724	739	703	716	948	843	756	724	749	819	970	724
##	[1009]	800	716	769	783	874	739	874	749	800	783	843	800	800	819
##	[1023]	739	756	749	819	800	749	819	769	874	800	783	874	869	756
##	[1037]	970	769	769	973	769	849	800	849	783	956	783	783	800	783
##	[1051]	783	937	800	783	783	783	897	909	800	783	800	832	783	783
##	[1065]	948	849	800	800	874	832	800	800	832	832	819	800	819	897

## [1079]	923	819	849	819	849	832	832	874	849	832	843	843	832	843
## [1093]	849	897	849	849	849	869	956	849	979	874	849	849	889	869
## [1107]	917	849	849	849	849	849	849	869	948	994	874	874	923	985
## [1121]	909	937	923	897	889	874	874	956	889	874	889	909	889	889
## [1135]	897	897	917	909	909	948	985	923	917	948	973	909	985	923
## [1149]	917	923	956	917	923	923	923	923	937	923	937	997	937	923
## [1163]	923	937	937	937	937	937	937	948	966	956	948	948	956	956
## [1177]	956	956	956	985	966	966	966	970	973	979	973	973	973	979
## [1191]	979	998	989	989	989	989	994	994	999	1000	1	4	2	13
## [1205]	9	12	7	22	33	22	20	25	29	9	6	3	60	32
## [1219]	14	79	15	26	143	112	27	11	18	16	70	71	5	8
## [1233]	74	270	19	295	295	388	143	21	90	34	117	154	67	24
## [1247]	38	28	38	89	56	17	52	74	43	125	204	97	344	59
## [1261]	150	34	63	55	90	34	53	49	41	90	34	67	119	31
## [1275]	40	46	235	156	51	106	79	46	99	41	44	154	46	84
## [1289]	54	29	110	79	71	74	85	56	140	235	102	200	95	143
## [1303]	99	906	74	190	103	56	190	67	65	130	204	60	273	83
## [1317]	60	111	119	130	44	95	106	103	195	318	66	87	79	164
## [1331]	97	164	190	74	204	209	112	134	49	140	112	646	63	289
## [1345]	161	71	90	130	447	87	90	138	85	99	134	115	127	150
## [1359]	125	130	150	127	170	122	281	105	127	179	119	147	109	106
## [1373]	147	216	116	124	184	251	188	209	147	219	122	349	204	117
## [1387]	184	170	176	164	265	396	134	242	204	235	161	256	174	159
## [1401]	170	235	179	134	174	197	184	161	138	195	270	159	247	169
## [1415]	143	179	156	190	200	209	150	256	200	184	156	388	219	335
## [1429]	200	219	213	242	164	140	179	188	197	247	247	170	213	176
## [1443]	273	265	318	164	227	265	190	1000	178	225	308	179	247	285
## [1457]	251	273	213	235	242	242	361	511	197	256	231	227	292	227
## [1471]	231	251	235	330	362	235	285	209	590	231	292	292	227	281
## [1485]	225	273	219	216	590	273	216	219	308	256	255	265	219	300
## [1499]	251	273	273	242	231	262	409	486	413	341	281	529	558	265
## [1513]	409	311	334	335	262	270	300	335	300	381	260	285	300	402
## [1527]	273	289	260	285	606	353	295	330	318	313	388	503	295	262
## [1541]	781	281	313	289	388	300	311	318	381	362	850	300	358	375
## [1555]	324	295	313	313	362	511	339	324	373	330	565	300	344	344
## [1569]	300	540	308	318	339	413	318	388	313	324	796	362	349	324
## [1583]	330	437	437	413	324	353	606	457	375	335	503	381	324	480
## [1597]	503	529	344	480	558	349	424	388	353	754	375	358	471	437
## [1611]	341	471	409	388	396	353	590	362	409	671	424	646	358	341
## [1625]	424	369	424	590	344	388	424	349	671	606	770	402	353	558
## [1639]	471	437	437	362	480	659	781	369	375	447	402	373	375	503
## [1653]	486	381	457	381	381	495	381	565	369	437	495	369	362	457
## [1667]	424	447	511	659	413	437	637	471	420	375	471	579	447	715
## [1681]	457	809	396	471	480	529	420	457	396	402	540	457	402	424
## [1695]	424	896	413	741	402	396	413	413	396	457	424	511	424	402
## [1709]	457	503	590	529	520	457	420	437	424	809	424	447	495	424
## [1723]	447	420	549	549	447	437	486	886	457	447	606	796	471	457
## [1737]	457	754	447	447	457	495	606	606	880	437	495	958	606	520
## [1751]	471	457	529	471	480	495	590	503	495	997	486	511	520	520
## [1765]	520	565	540	529	837	486	486	480	579	486	486	486	796	565
## [1779]	529	646	921	495	529	511	503	622	511	646	520	520	520	606
## [1793]	549	770	549	699	540	686	565	503	540	686	529	511	540	637
## [1807]	754	590	511	989	529	540	565	686	565	558	529	520	715	622
## [1821]	558	540	558	606	754	565	590	622	606	540	549	671	558	549

```
## [1835] 549 622 565 565 549 549 565 715 671 579 579 579 671 826
## [1849] 565 579 590 837 659 590 579 590 732 579 622 590 741 565
## [1863] 622 671 565 646 590 637 622 606 622 579 579 606 671 579
## [1877] 590 741 741 590 686 880 732 622 590 622 622 606 732 606
## [1891] 606 637 781 646 659 606 732 622 637 686 622 622 646 946
## [1905] 770 671 715 671 646 671 646 622 637 715 671 646 896 826
## [1919] 699 754 826 637 637 659 699 715 699 637 699 699 659 646
## [1933] 699 659 646 741 686 671 646 686 659 699 659 686 686 741
## [1947] 659 715 699 659 781 659 796 671 671 886 699 671 715 686
## [1961] 741 732 686 699 699 686 699 770 699 867 699 732 715 837
## [1975] 686 754 715 715 699 741 741 896 837 754 732 741 715 741
## [1989] 715 741 715 770 715 826 754 781 754 732 781 715 732 715
## [2003] 781 826 754 809 781 741 781 932 932 781 809 754 796 770
## [2017] 754 754 781 754 886 826 770 754 796 770 921 770 770 754
## [2031] 809 809 770 896 809 781 781 781 826 906 850 796 850 796
## [2045] 796 809 984 809 796 826 781 809 809 796 796 796 809 837
## [2059] 809 921 809 837 826 850 809 837 809 837 809 886 906 826
## [2073] 837 837 921 826 837 991 837 850 991 850 932 946 850 867
## [2087] 921 850 867 932 994 850 886 837 867 850 850 896 880 850
## [2101] 850 867 850 867 850 850 969 850 932 867 867 867 867 880
## [2115] 958 886 867 886 867 921 880 867 886 906 880 984 946 886
## [2129] 906 969 886 906 896 906 896 906 906 906 946 896 906 896
## [2143] 896 946 906 946 981 989 958 906 932 921 906 906 984 921
## [2157] 932 932 921 946 921 921 932 932 932 932 946 994 932 946
## [2171] 958 932 984 975 999 946 969 958 946 946 969 958 975 958
## [2185] 991 975 958 958 958 958 984 969 998 975 994 969 981 975
## [2199] 975 981
```

```
# Recode "Year" into categories (e.g., "New", "Middle-aged", "Old")
df$YearGroup <- cut(df$year, breaks = c(0, 2014, 2016, Inf), labels = c("Old", "Middle-aged", "New"))
df$YearGroup
```

```
## [1] Old Old Old Old Old Old
## [7] Old Old Old Old Old Old
## [13] Old Old Old Old Old Old
## [19] Old Old Old Old Old Old
## [25] Old Old Old Old Old Old
## [31] Old Old Old Old Old Old
## [37] Old Old Old Old Old Old
## [43] Old Old Old Old Old Old
## [49] Old Old Old Old Old Old
## [55] Old Old Old Old Old Old
## [61] Old Old Old Old Old Old
## [67] Old Old Old Old Old Old
## [73] Old Old Old Old Old Old
## [79] Old Old Old Old Old Old
## [85] Old Old Old Old Old Old
## [91] Old Old Old Old Old Old
## [97] Old Old Old Old Old Old
## [103] Old Old Old Old Old Old
## [109] Old Old Old Old Old Old
## [115] Old Old Old Old Old Old
## [121] Old Old Old Old Old Old
## [127] Old Old Old Old Old Old
```

##	[133]	01d	01d	01d	01d	01d	01d
##	[139]	01d	01d	01d	01d	01d	01d
##	[145]	01d	01d	01d	01d	01d	01d
##	[151]	01d	01d	01d	01d	01d	01d
##	[157]	01d	01d	01d	01d	01d	01d
##	[163]	01d	01d	01d	01d	01d	01d
##	[169]	01d	01d	01d	01d	01d	01d
##	[175]	01d	01d	01d	01d	01d	01d
##	[181]	01d	01d	01d	01d	01d	01d
##	[187]	01d	01d	01d	01d	01d	01d
##	[193]	01d	01d	01d	01d	01d	01d
##	[199]	01d	01d	01d	01d	01d	01d
##	[205]	01d	01d	01d	01d	01d	01d
##	[211]	01d	01d	01d	01d	01d	01d
##	[217]	01d	01d	01d	01d	01d	01d
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##	[253]	01d	01d	01d	01d	01d	01d
##	[259]	01d	01d	01d	01d	01d	01d
##	[265]	01d	01d	01d	01d	01d	01d
##	[271]	01d	01d	01d	01d	01d	01d
##	[277]	01d	01d	01d	01d	01d	01d
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##	[289]	01d	01d	01d	01d	01d	01d
##	[295]	01d	01d	01d	01d	01d	01d
##	[301]	01d	01d	01d	01d	01d	01d
##	[307]	01d	01d	01d	01d	01d	01d
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##	[319]	01d	01d	01d	01d	01d	01d
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##	[331]	01d	01d	01d	01d	01d	01d
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##	[343]	01d	01d	01d	01d	01d	01d
##	[349]	01d	01d	01d	01d	01d	01d
##	[355]	01d	01d	01d	01d	01d	01d
##	[361]	01d	01d	01d	01d	01d	01d
##	[367]	01d	01d	01d	01d	01d	01d
##	[373]	01d	01d	01d	01d	01d	01d
##	[379]	01d	01d	01d	01d	01d	01d
##	[385]	01d	01d	01d	01d	01d	01d
##	[391]	01d	01d	01d	01d	01d	01d
##	[397]	01d	01d	01d	01d	01d	01d
##	[403]	01d	01d	01d	01d	01d	01d
##	[409]	01d	01d	01d	01d	01d	01d
##	[415]	01d	01d	01d	01d	01d	01d
##	[421]	01d	01d	01d	01d	01d	01d
##	[427]	01d	01d	01d	01d	01d	01d
##	[433]	01d	01d	01d	01d	01d	01d
##	[439]	01d	01d	01d	01d	01d	01d
##	[445]	01d	01d	01d	01d	01d	01d
##	[451]	01d	01d	01d	01d	01d	01d

##	[457]	01d	01d	01d	01d	01d	01d
##	[463]	01d	01d	01d	01d	01d	01d
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##	[475]	01d	01d	01d	01d	01d	01d
##	[481]	01d	01d	01d	01d	01d	01d
##	[487]	01d	01d	01d	01d	01d	01d
##	[493]	01d	01d	01d	01d	01d	01d
##	[499]	01d	01d	01d	01d	01d	01d
##	[505]	01d	01d	01d	01d	01d	01d
##	[511]	01d	01d	01d	01d	01d	01d
##	[517]	01d	01d	01d	01d	01d	01d
##	[523]	01d	01d	01d	01d	01d	01d
##	[529]	01d	01d	01d	01d	01d	01d
##	[535]	01d	01d	01d	01d	01d	01d
##	[541]	01d	01d	01d	01d	01d	01d
##	[547]	01d	01d	01d	01d	01d	01d
##	[553]	01d	01d	01d	01d	01d	01d
##	[559]	01d	01d	01d	01d	01d	01d
##	[565]	01d	01d	01d	01d	01d	01d
##	[571]	01d	01d	01d	01d	01d	01d
##	[577]	01d	01d	01d	01d	01d	01d
##	[583]	01d	01d	01d	01d	01d	01d
##	[589]	01d	01d	01d	01d	01d	01d
##	[595]	01d	01d	01d	01d	01d	01d
##	[601]	01d	01d	01d	01d	01d	01d
##	[607]	01d	01d	01d	01d	01d	01d
##	[613]	01d	01d	01d	01d	01d	01d
##	[619]	01d	01d	01d	01d	01d	01d
##	[625]	01d	01d	01d	01d	01d	01d
##	[631]	01d	01d	01d	01d	01d	01d
##	[637]	01d	01d	01d	01d	01d	01d
##	[643]	01d	01d	01d	01d	01d	01d
##	[649]	01d	01d	01d	01d	01d	01d
##	[655]	01d	01d	01d	01d	01d	01d
##	[661]	01d	01d	01d	01d	01d	01d
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##	[673]	01d	01d	01d	01d	01d	01d
##	[679]	01d	01d	01d	01d	01d	01d
##	[685]	01d	01d	01d	01d	01d	01d
##	[691]	01d	01d	01d	01d	01d	01d
##	[697]	01d	01d	01d	01d	01d	01d
##	[703]	01d	01d	01d	01d	01d	01d
##	[709]	01d	01d	01d	01d	01d	01d
##	[715]	01d	01d	01d	01d	01d	01d
##	[721]	01d	01d	01d	01d	01d	01d
##	[727]	01d	01d	01d	01d	01d	01d
##	[733]	01d	01d	01d	01d	01d	01d
##	[739]	01d	01d	01d	01d	01d	01d
##	[745]	01d	01d	01d	01d	01d	01d
##	[751]	01d	01d	01d	01d	01d	01d
##	[757]	01d	01d	01d	01d	01d	01d
##	[763]	01d	01d	01d	01d	01d	01d
##	[769]	01d	01d	01d	01d	01d	01d
##	[775]	01d	01d	01d	01d	01d	01d

##	[781]	01d	01d	01d	01d	01d	01d
##	[787]	01d	01d	01d	01d	01d	01d
##	[793]	01d	01d	01d	01d	01d	01d
##	[799]	01d	01d	01d	01d	01d	01d
##	[805]	01d	01d	01d	01d	01d	01d
##	[811]	01d	01d	01d	01d	01d	01d
##	[817]	01d	01d	01d	01d	01d	01d
##	[823]	01d	01d	01d	01d	01d	01d
##	[829]	01d	01d	01d	01d	01d	01d
##	[835]	01d	01d	01d	01d	01d	01d
##	[841]	01d	01d	01d	01d	01d	01d
##	[847]	01d	01d	01d	01d	01d	01d
##	[853]	01d	01d	01d	01d	01d	01d
##	[859]	01d	01d	01d	01d	01d	01d
##	[865]	01d	01d	01d	01d	01d	01d
##	[871]	01d	01d	01d	01d	01d	01d
##	[877]	01d	01d	01d	01d	01d	01d
##	[883]	01d	01d	01d	01d	01d	01d
##	[889]	01d	01d	01d	01d	01d	01d
##	[895]	01d	01d	01d	01d	01d	01d
##	[901]	01d	01d	01d	01d	01d	01d
##	[907]	01d	01d	01d	01d	01d	01d
##	[913]	01d	01d	01d	01d	01d	01d
##	[919]	01d	01d	01d	01d	01d	01d
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##	[931]	01d	01d	01d	01d	01d	01d
##	[937]	01d	01d	01d	01d	01d	01d
##	[943]	01d	01d	01d	01d	01d	01d
##	[949]	01d	01d	01d	01d	01d	01d
##	[955]	01d	01d	01d	01d	01d	01d
##	[961]	01d	01d	01d	01d	01d	01d
##	[967]	01d	01d	01d	01d	01d	01d
##	[973]	01d	01d	01d	01d	01d	01d
##	[979]	01d	01d	01d	01d	01d	01d
##	[985]	01d	01d	01d	01d	01d	01d
##	[991]	01d	01d	01d	01d	01d	01d
##	[997]	01d	01d	01d	01d	01d	01d
##	[1003]	01d	01d	01d	01d	01d	01d
##	[1009]	01d	01d	01d	01d	01d	01d
##	[1015]	01d	01d	01d	01d	01d	01d
##	[1021]	01d	01d	01d	01d	01d	01d
##	[1027]	01d	01d	01d	01d	01d	01d
##	[1033]	01d	01d	01d	01d	01d	01d
##	[1039]	01d	01d	01d	01d	01d	01d
##	[1045]	01d	01d	01d	01d	01d	01d
##	[1051]	01d	01d	01d	01d	01d	01d
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##	[1063]	01d	01d	01d	01d	01d	01d
##	[1069]	01d	01d	01d	01d	01d	01d
##	[1075]	01d	01d	01d	01d	01d	01d
##	[1081]	01d	01d	01d	01d	01d	01d
##	[1087]	01d	01d	01d	01d	01d	01d
##	[1093]	01d	01d	01d	01d	01d	01d
##	[1099]	01d	01d	01d	01d	01d	01d

[illegible]

[illegible]

[illegible]

```
## [2077] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2083] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2089] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2095] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2101] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2107] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2113] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2119] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2125] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2131] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2137] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2143] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2149] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2155] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2161] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2167] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2173] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2179] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2185] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2191] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## [2197] Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged Middle-aged
## Levels: Old Middle-aged New
```

```
# Transform "Points" by squaring each value
df$Squared <- df$broad_impact^2
df$broad_impact
```

```
##      [1]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##     [15]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##     [29]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##     [43]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##     [57]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##     [71]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##     [85]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##     [99]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##    [113]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##    [127]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##    [141]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##    [155]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##    [169]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##    [183]      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA      NA
##    [197]      NA      NA      NA      NA      1      4      2     13     12     13      7     18     41     19
##    [211]     23     24     26     10      6     51     31     86      3     16     10    151     27    107
##    [225]     28     15      9     68     74     21      8      5     51    266    311    295     62    137
##    [239]     17    380     89     32     56    132     22     33     37    361     29    102     54    121
##    [253]     24    144    155     46     50     19     63     56     41     94     77    238    215     34
##    [267]     37     66     59     46     40    112     36    102     79     73     70     37     34     51
##    [281]     97     48    101     81     56    151    162     49     54     77    145    207    124     59
##    [295]     94    180     81    145     97    326     45     70     99     30    137    145    251    121
##    [309]    207     74    100    106    195    472    102     70     66    211     90     88     41     68
##    [323]    110    102    110    118     79    306     81    293    162    192     61     64    137    129
##    [337]     92    114    158    107     81    135     44     86    126    129    135    251    164    437
##    [351]    151    176    318    141    118    121     81     90    117    196    124    355    107     74
##    [365]     64    132    917    112    196    173    628     94    164    415     92    224    129    145
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##	[379]	132	203	114	176	114	126	137	295	185	251	230	306	160	155
##	[393]	118	128	234	234	238	339	161	201	155	203	234	295	192	290
##	[407]	247	201	189	180	189	141	145	141	249	176	288	185	169	249
##	[421]	207	169	173	215	176	200	224	238	164	196	151	158	185	215
##	[435]	203	322	211	230	145	189	196	472	272	192	173	395	277	220
##	[449]	164	164	169	184	220	224	220	180	169	523	220	180	266	211
##	[463]	185	230	238	261	274	230	251	266	281	238	251	215	245	224
##	[477]	281	256	266	306	322	207	585	272	756	277	355	256	215	349
##	[491]	295	313	203	569	211	295	372	266	224	346	261	274	234	265
##	[505]	245	596	832	266	261	238	504	224	256	420	819	295	256	375
##	[519]	346	277	247	295	281	326	261	281	420	756	402	274	306	386
##	[533]	238	543	337	295	326	277	749	313	281	295	293	288	256	281
##	[547]	523	341	361	318	339	290	334	472	313	386	322	311	281	318
##	[561]	523	386	318	596	472	349	295	290	355	690	430	409	295	452
##	[575]	343	306	313	349	334	569	395	326	488	523	504	343	313	326
##	[589]	504	355	326	460	341	663	337	724	769	409	642	430	380	442
##	[603]	322	366	326	618	380	504	420	514	442	514	402	326	415	749
##	[617]	514	386	402	897	355	543	334	420	361	343	420	889	618	370
##	[631]	355	361	346	415	395	769	386	420	430	496	361	349	642	504
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##	[771]	496	488	703	703	460	756	514	472	642	514	554	482	488	724
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