Lab-assignment01

saivarun tanjore raghavendra

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## R Markdown

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When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

## a) Import the “carseats” dataset, look at the first few rows and inspect the data types of the variables in dataframe.

data = read.csv("/Users/trsaivarun/Desktop/R programs/lab assignments/carseats(1).csv")

head(data)

## Sales CompPrice Income Advertising Population Price ShelveLoc Age Education  
## 1 9.50 138 73 11 276 120 Bad 42 17  
## 2 11.22 111 48 16 260 83 Good 65 10  
## 3 10.06 113 35 10 269 80 Medium 59 12  
## 4 7.40 117 100 4 466 97 Medium 55 14  
## 5 4.15 141 64 3 340 128 Bad 38 13  
## 6 10.81 124 113 13 501 72 Bad 78 16  
## Urban US  
## 1 Yes Yes  
## 2 Yes Yes  
## 3 Yes Yes  
## 4 Yes Yes  
## 5 Yes No  
## 6 No Yes

str(data)

## 'data.frame': 400 obs. of 11 variables:  
## $ Sales : num 9.5 11.22 10.06 7.4 4.15 ...  
## $ CompPrice : int 138 111 113 117 141 124 115 136 132 132 ...  
## $ Income : int 73 48 35 100 64 113 105 81 110 113 ...  
## $ Advertising: int 11 16 10 4 3 13 0 15 0 0 ...  
## $ Population : int 276 260 269 466 340 501 45 425 108 131 ...  
## $ Price : int 120 83 80 97 128 72 108 120 124 124 ...  
## $ ShelveLoc : chr "Bad" "Good" "Medium" "Medium" ...  
## $ Age : int 42 65 59 55 38 78 71 67 76 76 ...  
## $ Education : int 17 10 12 14 13 16 15 10 10 17 ...  
## $ Urban : chr "Yes" "Yes" "Yes" "Yes" ...  
## $ US : chr "Yes" "Yes" "Yes" "Yes" ...

## b) Change the variables “ShelveLoc, urban, US” into a factor variables.

data$ShelveLoc = factor(data$ShelveLoc)  
str(data)

## 'data.frame': 400 obs. of 11 variables:  
## $ Sales : num 9.5 11.22 10.06 7.4 4.15 ...  
## $ CompPrice : int 138 111 113 117 141 124 115 136 132 132 ...  
## $ Income : int 73 48 35 100 64 113 105 81 110 113 ...  
## $ Advertising: int 11 16 10 4 3 13 0 15 0 0 ...  
## $ Population : int 276 260 269 466 340 501 45 425 108 131 ...  
## $ Price : int 120 83 80 97 128 72 108 120 124 124 ...  
## $ ShelveLoc : Factor w/ 4 levels "","Bad","Good",..: 2 3 4 4 2 2 4 3 4 4 ...  
## $ Age : int 42 65 59 55 38 78 71 67 76 76 ...  
## $ Education : int 17 10 12 14 13 16 15 10 10 17 ...  
## $ Urban : chr "Yes" "Yes" "Yes" "Yes" ...  
## $ US : chr "Yes" "Yes" "Yes" "Yes" ...

data$US = factor(data$US)  
str(data)

## 'data.frame': 400 obs. of 11 variables:  
## $ Sales : num 9.5 11.22 10.06 7.4 4.15 ...  
## $ CompPrice : int 138 111 113 117 141 124 115 136 132 132 ...  
## $ Income : int 73 48 35 100 64 113 105 81 110 113 ...  
## $ Advertising: int 11 16 10 4 3 13 0 15 0 0 ...  
## $ Population : int 276 260 269 466 340 501 45 425 108 131 ...  
## $ Price : int 120 83 80 97 128 72 108 120 124 124 ...  
## $ ShelveLoc : Factor w/ 4 levels "","Bad","Good",..: 2 3 4 4 2 2 4 3 4 4 ...  
## $ Age : int 42 65 59 55 38 78 71 67 76 76 ...  
## $ Education : int 17 10 12 14 13 16 15 10 10 17 ...  
## $ Urban : chr "Yes" "Yes" "Yes" "Yes" ...  
## $ US : Factor w/ 2 levels "No","Yes": 2 2 2 2 1 2 1 2 1 2 ...

data$Urban = factor(data$Urban)  
str(data)

## 'data.frame': 400 obs. of 11 variables:  
## $ Sales : num 9.5 11.22 10.06 7.4 4.15 ...  
## $ CompPrice : int 138 111 113 117 141 124 115 136 132 132 ...  
## $ Income : int 73 48 35 100 64 113 105 81 110 113 ...  
## $ Advertising: int 11 16 10 4 3 13 0 15 0 0 ...  
## $ Population : int 276 260 269 466 340 501 45 425 108 131 ...  
## $ Price : int 120 83 80 97 128 72 108 120 124 124 ...  
## $ ShelveLoc : Factor w/ 4 levels "","Bad","Good",..: 2 3 4 4 2 2 4 3 4 4 ...  
## $ Age : int 42 65 59 55 38 78 71 67 76 76 ...  
## $ Education : int 17 10 12 14 13 16 15 10 10 17 ...  
## $ Urban : Factor w/ 3 levels "","No","Yes": 3 3 3 3 3 2 3 3 2 2 ...  
## $ US : Factor w/ 2 levels "No","Yes": 2 2 2 2 1 2 1 2 1 2 ...

## c) create a new variable called “profit” which stands for “Income - Advertising”

data$profit = data$Income - data$Advertising  
data$profit

## [1] 62 32 25 96 61 100 105 66 110 113 69 90 33 17 106 90 32 61  
## [19] 110 60 88 17 40 31 103 32 104 118 74 84 94 42 20 25 54 73  
## [37] 76 36 73 60 98 53 69 31 73 63 76 98 52 93 14 90 37 51  
## [55] 90 76 82 91 78 67 83 32 45 78 55 26 92 47 49 59 66 35  
## [73] 45 80 63 88 77 59 47 67 84 72 79 29 25 103 75 60 35 63  
## [91] 22 35 113 30 92 15 32 77 53 44 58 93 22 91 96 92 33 107  
## [109] 77 65 55 106 94 18 78 35 75 53 86 86 94 79 95 103 113 78  
## [127] 66 45 97 113 71 66 78 96 31 80 75 42 91 52 50 42 84 81  
## [145] 68 52 83 45 119 107 76 41 78 29 59 72 34 50 89 60 28 16  
## [163] 74 64 64 51 50 73 89 26 27 94 89 86 24 89 98 72 57 22  
## [181] 97 83 56 68 26 89 51 32 37 99 24 29 26 63 80 89 22 61  
## [199] 75 83 92 83 74 82 80 21 67 105 54 10 39 104 50 79 112 68  
## [217] 33 44 49 60 105 44 113 36 82 25 33 54 60 104 60 69 70 58  
## [235] 51 24 18 20 24 105 80 63 46 12 30 43 36 114 52 67 95 106  
## [253] 97 19 81 73 40 48 38 26 109 38 62 20 24 25 81 75 57 69  
## [271] 26 56 33 98 91 108 55 36 111 44 76 62 96 110 35 15 107 40  
## [289] 40 52 97 70 50 84 73 21 31 70 63 23 77 93 64 36 86 3  
## [307] 31 92 61 98 36 56 112 78 23 13 31 30 62 26 58 34 40 87  
## [325] 61 58 30 21 65 45 59 48 13 53 108 55 29 38 24 40 29 120  
## [343] 89 32 80 68 107 39 82 9 84 99 89 55 30 100 109 70 86 51  
## [361] 79 15 55 74 5 30 45 106 12 78 19 81 50 71 40 42 41 61  
## [379] 85 111 NA 44 9 117 22 60 116 59 78 34 66 63 29 41 39 91  
## [397] 20 14 72 37

data

## Sales CompPrice Income Advertising Population Price ShelveLoc Age Education  
## 1 9.50 138 73 11 276 120 Bad 42 17  
## 2 11.22 111 48 16 260 83 Good 65 10  
## 3 10.06 113 35 10 269 80 Medium 59 12  
## 4 7.40 117 100 4 466 97 Medium 55 14  
## 5 4.15 141 64 3 340 128 Bad 38 13  
## 6 10.81 124 113 13 501 72 Bad 78 16  
## 7 6.63 115 105 0 45 108 Medium 71 15  
## 8 11.85 136 81 15 425 120 Good 67 10  
## 9 6.54 132 110 0 108 124 Medium 76 10  
## 10 4.69 132 113 0 131 124 Medium 76 17  
## 11 9.01 121 78 9 150 100 Bad 26 10  
## 12 11.96 117 94 4 503 94 Good 50 13  
## 13 3.98 122 35 2 393 136 Medium 62 18  
## 14 10.96 115 28 11 29 86 Good 53 18  
## 15 11.17 107 117 11 148 118 Good 52 18  
## 16 8.71 149 95 5 400 144 Medium 76 18  
## 17 7.58 118 32 0 284 110 Good 63 13  
## 18 12.29 147 74 13 251 131 Good 52 10  
## 19 13.91 110 110 0 408 68 Good 46 17  
## 20 8.73 129 76 16 58 121 Medium 69 12  
## 21 6.41 125 90 2 367 131 Medium 35 18  
## 22 12.13 134 29 12 239 109 Good 62 18  
## 23 5.08 128 46 6 497 138 Medium 42 13  
## 24 5.87 121 31 0 292 109 Medium 79 10  
## 25 10.14 145 119 16 294 113 Bad 42 12  
## 26 14.90 139 32 0 176 82 Good 54 11  
## 27 8.33 107 115 11 496 131 Good 50 11  
## 28 5.27 98 118 0 19 107 Medium 64 17  
## 29 2.99 103 74 0 359 97 Bad 55 11  
## 30 7.81 104 99 15 226 102 Bad 58 17  
## 31 13.55 125 94 0 447 89 Good 30 12  
## 32 8.25 136 58 16 241 131 Medium 44 18  
## 33 6.20 107 32 12 236 137 Good 64 10  
## 34 8.77 114 38 13 317 128 Good 50 16  
## 35 2.67 115 54 0 406 128 Medium 42 17  
## 36 11.07 131 84 11 29 96 Medium 44 17  
## 37 8.89 122 76 0 270 100 Good 60 18  
## 38 4.95 121 41 5 412 110 Medium 54 10  
## 39 6.59 109 73 0 454 102 Medium 65 15  
## 40 3.24 130 60 0 144 138 Bad 38 10  
## 41 2.07 119 98 0 18 126 Bad 73 17  
## 42 7.96 157 53 0 403 124 Bad 58 16  
## 43 10.43 77 69 0 25 24 Medium 50 18  
## 44 4.12 123 42 11 16 134 Medium 59 13  
## 45 4.16 85 79 6 325 95 Medium 69 13  
## 46 4.56 141 63 0 168 135 Bad 44 12  
## 47 12.44 127 90 14 16 70 Medium 48 15  
## 48 4.38 126 98 0 173 108 Bad 55 16  
## 49 3.91 116 52 0 349 98 Bad 69 18  
## 50 10.61 157 93 0 51 149 Good 32 17  
## 51 1.42 99 32 18 341 108 Bad 80 16  
## 52 4.42 121 90 0 150 108 Bad 75 16  
## 53 7.91 153 40 3 112 129 Bad 39 18  
## 54 6.92 109 64 13 39 119 Medium 61 17  
## 55 4.90 134 103 13 25 144 Medium 76 17  
## 56 6.85 143 81 5 60 154 Medium 61 18  
## 57 11.91 133 82 0 54 84 Medium 50 17  
## 58 0.91 93 91 0 22 117 Bad 75 11  
## 59 5.42 103 93 15 188 103 Bad 74 16  
## 60 5.21 118 71 4 148 114 Medium 80 13  
## 61 8.32 122 102 19 469 123 Bad 29 13  
## 62 7.32 105 32 0 358 107 Medium 26 13  
## 63 1.82 139 45 0 146 133 Bad 77 17  
## 64 8.47 119 88 10 170 101 Medium 61 13  
## 65 7.80 100 67 12 184 104 Medium 32 16  
## 66 4.90 122 26 0 197 128 Medium 55 13  
## 67 8.85 127 92 0 508 91 Medium 56 18  
## 68 9.01 126 61 14 152 115 Medium 47 16  
## 69 13.39 149 69 20 366 134 Good 60 13  
## 70 7.99 127 59 0 339 99 Medium 65 12  
## 71 9.46 89 81 15 237 99 Good 74 12  
## 72 6.50 148 51 16 148 150 Medium 58 17  
## 73 5.52 115 45 0 432 116 Medium 25 15  
## 74 12.61 118 90 10 54 104 Good 31 11  
## 75 6.20 150 68 5 125 136 Medium 64 13  
## 76 8.55 88 111 23 480 92 Bad 36 16  
## 77 10.64 102 87 10 346 70 Medium 64 15  
## 78 7.70 118 71 12 44 89 Medium 67 18  
## 79 4.43 134 48 1 139 145 Medium 65 12  
## 80 9.14 134 67 0 286 90 Bad 41 13  
## 81 8.01 113 100 16 353 79 Bad 68 11  
## 82 7.52 116 72 0 237 128 Good 70 13  
## 83 11.62 151 83 4 325 139 Good 28 17  
## 84 4.42 109 36 7 468 94 Bad 56 11  
## 85 2.23 111 25 0 52 121 Bad 43 18  
## 86 8.47 125 103 0 304 112 Medium 49 13  
## 87 8.70 150 84 9 432 134 Medium 64 15  
## 88 11.70 131 67 7 272 126 Good 54 16  
## 89 6.56 117 42 7 144 111 Medium 62 10  
## 90 7.95 128 66 3 493 119 Medium 45 16  
## 91 5.33 115 22 0 491 103 Medium 64 11  
## 92 4.81 97 46 11 267 107 Medium 80 15  
## 93 4.53 114 113 0 97 125 Medium 29 12  
## 94 8.86 145 30 0 67 104 Medium 55 17  
## 95 8.39 115 97 5 134 84 Bad 55 11  
## 96 5.58 134 25 10 237 148 Medium 59 13  
## 97 9.48 147 42 10 407 132 Good 73 16  
## 98 7.45 161 82 5 287 129 Bad 33 16  
## 99 12.49 122 77 24 382 127 Good 36 16  
## 100 4.88 121 47 3 220 107 Bad 56 16  
## 101 4.11 113 69 11 94 106 Medium 76 12  
## 102 6.20 128 93 0 89 118 Medium 34 18  
## 103 5.30 113 22 0 57 97 Medium 65 16  
## 104 5.07 123 91 0 334 96 Bad 78 17  
## 105 4.62 121 96 0 472 138 Medium 51 12  
## 106 5.55 104 100 8 398 97 Medium 61 11  
## 107 0.16 102 33 0 217 139 Medium 70 18  
## 108 8.55 134 107 0 104 108 Medium 60 12  
## 109 3.47 107 79 2 488 103 Bad 65 16  
## 110 8.98 115 65 0 217 90 Medium 60 17  
## 111 9.00 128 62 7 125 116 Medium 43 14  
## 112 6.62 132 118 12 272 151 Medium 43 14  
## 113 6.67 116 99 5 298 125 Good 62 12  
## 114 6.01 131 29 11 335 127 Bad 33 12  
## 115 9.31 122 87 9 17 106 Medium 65 13  
## 116 8.54 139 35 0 95 129 Medium 42 13  
## 117 5.08 135 75 0 202 128 Medium 80 10  
## 118 8.80 145 53 0 507 119 Medium 41 12  
## 119 7.57 112 88 2 243 99 Medium 62 11  
## 120 7.37 130 94 8 137 128 Medium 64 12  
## 121 6.87 128 105 11 249 131 Medium 63 13  
## 122 11.67 125 89 10 380 87 Bad 28 10  
## 123 6.88 119 100 5 45 108 Medium 75 10  
## 124 8.19 127 103 0 125 155 Good 29 15  
## 125 8.87 131 113 0 181 120 Good 63 14  
## 126 9.34 89 78 0 181 49 Medium 43 15  
## 127 11.27 153 68 2 60 133 Good 59 16  
## 128 6.52 125 48 3 192 116 Medium 51 14  
## 129 4.96 133 100 3 350 126 Bad 55 13  
## 130 4.47 143 120 7 279 147 Bad 40 10  
## 131 8.41 94 84 13 497 77 Medium 51 12  
## 132 6.50 108 69 3 208 94 Medium 77 16  
## 133 9.54 125 87 9 232 136 Good 72 10  
## 134 7.62 132 98 2 265 97 Bad 62 12  
## 135 3.67 132 31 0 327 131 Medium 76 16  
## 136 6.44 96 94 14 384 120 Medium 36 18  
## 137 5.17 131 75 0 10 120 Bad 31 18  
## 138 6.52 128 42 0 436 118 Medium 80 11  
## 139 10.27 125 103 12 371 109 Medium 44 10  
## 140 12.30 146 62 10 310 94 Medium 30 13  
## 141 6.03 133 60 10 277 129 Medium 45 18  
## 142 6.53 140 42 0 331 131 Bad 28 15  
## 143 7.44 124 84 0 300 104 Medium 77 15  
## 144 0.53 122 88 7 36 159 Bad 28 17  
## 145 9.09 132 68 0 264 123 Good 34 11  
## 146 8.77 144 63 11 27 117 Medium 47 17  
## 147 3.90 114 83 0 412 131 Bad 39 14  
## 148 10.51 140 54 9 402 119 Good 41 16  
## 149 7.56 110 119 0 384 97 Medium 72 14  
## 150 11.48 121 120 13 140 87 Medium 56 11  
## 151 10.49 122 84 8 176 114 Good 57 10  
## 152 10.77 111 58 17 407 103 Good 75 17  
## 153 7.64 128 78 0 341 128 Good 45 13  
## 154 5.93 150 36 7 488 150 Medium 25 17  
## 155 6.89 129 69 10 289 110 Medium 50 16  
## 156 7.71 98 72 0 59 69 Medium 65 16  
## 157 7.49 146 34 0 220 157 Good 51 16  
## 158 10.21 121 58 8 249 90 Medium 48 13  
## 159 12.53 142 90 1 189 112 Good 39 10  
## 160 9.32 119 60 0 372 70 Bad 30 18  
## 161 4.67 111 28 0 486 111 Medium 29 12  
## 162 2.93 143 21 5 81 160 Medium 67 12  
## 163 3.63 122 74 0 424 149 Medium 51 13  
## 164 5.68 130 64 0 40 106 Bad 39 17  
## 165 8.22 148 64 0 58 141 Medium 27 13  
## 166 0.37 147 58 7 100 191 Bad 27 15  
## 167 6.71 119 67 17 151 137 Medium 55 11  
## 168 6.71 106 73 0 216 93 Medium 60 13  
## 169 7.30 129 89 0 425 117 Medium 45 10  
## 170 11.48 104 41 15 492 77 Good 73 18  
## 171 8.01 128 39 12 356 118 Medium 71 10  
## 172 12.49 93 106 12 416 55 Medium 75 15  
## 173 9.03 104 102 13 123 110 Good 35 16  
## 174 6.38 135 91 5 207 128 Medium 66 18  
## 175 0.00 139 24 0 358 185 Medium 79 15  
## 176 7.54 115 89 0 38 122 Medium 25 12  
## 177 5.61 138 107 9 480 154 Medium 47 11  
## 178 10.48 138 72 0 148 94 Medium 27 17  
## 179 10.66 104 71 14 89 81 Medium 25 14  
## 180 7.78 144 25 3 70 116 Medium 77 18  
## 181 4.94 137 112 15 434 149 Bad 66 13  
## 182 7.43 121 83 0 79 91 Medium 68 11  
## 183 4.74 137 60 4 230 140 Bad 25 13  
## 184 5.32 118 74 6 426 102 Medium 80 18  
## 185 9.95 132 33 7 35 97 Medium 60 11  
## 186 10.07 130 100 11 449 107 Medium 64 10  
## 187 8.68 120 51 0 93 86 Medium 46 17  
## 188 6.03 117 32 0 142 96 Bad 62 17  
## 189 8.07 116 37 0 426 90 Medium 76 15  
## 190 12.11 118 117 18 509 104 Medium 26 15  
## 191 8.79 130 37 13 297 101 Medium 37 13  
## 192 6.67 156 42 13 170 173 Good 74 14  
## 193 7.56 108 26 0 408 93 Medium 56 14  
## 194 13.28 139 70 7 71 96 Good 61 10  
## 195 7.23 112 98 18 481 128 Medium 45 11  
## 196 4.19 117 93 4 420 112 Bad 66 11  
## 197 4.10 130 28 6 410 133 Bad 72 16  
## 198 2.52 124 61 0 333 138 Medium 76 16  
## 199 3.62 112 80 5 500 128 Medium 69 10  
## 200 6.42 122 88 5 335 126 Medium 64 14  
## 201 5.56 144 92 0 349 146 Medium 62 12  
## 202 5.94 138 83 0 139 134 Medium 54 18  
## 203 4.10 121 78 4 413 130 Bad 46 10  
## 204 2.05 131 82 0 132 157 Bad 25 14  
## 205 8.74 155 80 0 237 124 Medium 37 14  
## 206 5.68 113 22 1 317 132 Medium 28 12  
## 207 4.97 162 67 0 27 160 Medium 77 17  
## 208 8.19 111 105 0 466 97 Bad 61 10  
## 209 7.78 86 54 0 497 64 Bad 33 12  
## 210 3.02 98 21 11 326 90 Bad 76 11  
## 211 4.36 125 41 2 357 123 Bad 47 14  
## 212 9.39 117 118 14 445 120 Medium 32 15  
## 213 12.04 145 69 19 501 105 Medium 45 11  
## 214 8.23 149 84 5 220 139 Medium 33 10  
## 215 4.83 115 115 3 48 107 Medium 73 18  
## 216 2.34 116 83 15 170 144 Bad 71 11  
## 217 5.73 141 33 0 243 144 Medium 34 17  
## 218 4.34 106 44 0 481 111 Medium 70 14  
## 219 9.70 138 61 12 156 120 Medium 25 14  
## 220 10.62 116 79 19 359 116 Good 58 17  
## 221 10.59 131 120 15 262 124 Medium 30 10  
## 222 6.43 124 44 0 125 107 Medium 80 11  
## 223 7.49 136 119 6 178 145 Medium 35 13  
## 224 3.45 110 45 9 276 125 Medium 62 14  
## 225 4.10 134 82 0 464 141 Medium 48 13  
## 226 6.68 107 25 0 412 82 Bad 36 14  
## 227 7.80 119 33 0 245 122 Good 56 14  
## 228 8.69 113 64 10 68 101 Medium 57 16  
## 229 5.40 149 73 13 381 163 Bad 26 11  
## 230 11.19 98 104 0 404 72 Medium 27 18  
## 231 5.16 115 60 0 119 114 Bad 38 14  
## 232 8.09 132 69 0 123 122 Medium 27 11  
## 233 13.14 137 80 10 24 105 Good 61 15  
## 234 8.65 123 76 18 218 120 Medium 29 14  
## 235 9.43 115 62 11 289 129 Good 56 16  
## 236 5.53 126 32 8 95 132 Medium 50 17  
## 237 9.32 141 34 16 361 108 Medium 69 10  
## 238 9.62 151 28 8 499 135 Medium 48 10  
## 239 7.36 121 24 0 200 133 Good 73 13  
## 240 3.89 123 105 0 149 118 Bad 62 16  
## 241 10.31 159 80 0 362 121 Medium 26 18  
## 242 12.01 136 63 0 160 94 Medium 38 12  
## 243 4.68 124 46 0 199 135 Medium 52 14  
## 244 7.82 124 25 13 87 110 Medium 57 10  
## 245 8.78 130 30 0 391 100 Medium 26 18  
## 246 10.00 114 43 0 199 88 Good 57 10  
## 247 6.90 120 56 20 266 90 Bad 78 18  
## 248 5.04 123 114 0 298 151 Bad 34 16  
## 249 5.36 111 52 0 12 101 Medium 61 11  
## 250 5.05 125 67 0 86 117 Bad 65 11  
## 251 9.16 137 105 10 435 156 Good 72 14  
## 252 3.72 139 111 5 310 132 Bad 62 13  
## 253 8.31 133 97 0 70 117 Medium 32 16  
## 254 5.64 124 24 5 288 122 Medium 57 12  
## 255 9.58 108 104 23 353 129 Good 37 17  
## 256 7.71 123 81 8 198 81 Bad 80 15  
## 257 4.20 147 40 0 277 144 Medium 73 10  
## 258 8.67 125 62 14 477 112 Medium 80 13  
## 259 3.47 108 38 0 251 81 Bad 72 14  
## 260 5.12 123 36 10 467 100 Bad 74 11  
## 261 7.67 129 117 8 400 101 Bad 36 10  
## 262 5.71 121 42 4 188 118 Medium 54 15  
## 263 6.37 120 77 15 86 132 Medium 48 18  
## 264 7.77 116 26 6 434 115 Medium 25 17  
## 265 6.95 128 29 5 324 159 Good 31 15  
## 266 5.31 130 35 10 402 129 Bad 39 17  
## 267 9.10 128 93 12 343 112 Good 73 17  
## 268 5.83 134 82 7 473 112 Bad 51 12  
## 269 6.53 123 57 0 66 105 Medium 39 11  
## 270 5.01 159 69 0 438 166 Medium 46 17  
## 271 11.99 119 26 0 284 89 Good 26 10  
## 272 4.55 111 56 0 504 110 Medium 62 16  
## 273 12.98 113 33 0 14 63 Good 38 12  
## 274 10.04 116 106 8 244 86 Medium 58 12  
## 275 7.22 135 93 2 67 119 Medium 34 11  
## 276 6.67 107 119 11 210 132 Medium 53 11  
## 277 6.93 135 69 14 296 130 Medium 73 15  
## 278 7.80 136 48 12 326 125 Medium 36 16  
## 279 7.22 114 113 2 129 151 Good 40 15  
## 280 3.42 141 57 13 376 158 Medium 64 18  
## 281 2.86 121 86 10 496 145 Bad 51 10  
## 282 11.19 122 69 7 303 105 Good 45 16  
## 283 7.74 150 96 0 80 154 Good 61 11  
## 284 5.36 135 110 0 112 117 Medium 80 16  
## 285 6.97 106 46 11 414 96 Bad 79 17  
## 286 7.60 146 26 11 261 131 Medium 39 10  
## 287 7.53 117 118 11 429 113 Medium 67 18  
## 288 6.88 95 44 4 208 72 Bad 44 17  
## 289 6.98 116 40 0 74 97 Medium 76 15  
## 290 8.75 143 77 25 448 156 Medium 43 17  
## 291 9.49 107 111 14 400 103 Medium 41 11  
## 292 6.64 118 70 0 106 89 Bad 39 17  
## 293 11.82 113 66 16 322 74 Good 76 15  
## 294 11.28 123 84 0 74 89 Good 59 10  
## 295 12.66 148 76 3 126 99 Good 60 11  
## 296 4.21 118 35 14 502 137 Medium 79 10  
## 297 8.21 127 44 13 160 123 Good 63 18  
## 298 3.07 118 83 13 276 104 Bad 75 10  
## 299 10.98 148 63 0 312 130 Good 63 15  
## 300 9.40 135 40 17 497 96 Medium 54 17  
## 301 8.57 116 78 1 158 99 Medium 45 11  
## 302 7.41 99 93 0 198 87 Medium 57 16  
## 303 5.28 108 77 13 388 110 Bad 74 14  
## 304 10.01 133 52 16 290 99 Medium 43 11  
## 305 11.93 123 98 12 408 134 Good 29 10  
## 306 8.03 115 29 26 394 132 Medium 33 13  
## 307 4.78 131 32 1 85 133 Medium 48 12  
## 308 5.90 138 92 0 13 120 Bad 61 12  
## 309 9.24 126 80 19 436 126 Medium 52 10  
## 310 11.18 131 111 13 33 80 Bad 68 18  
## 311 9.53 175 65 29 419 166 Medium 53 12  
## 312 6.15 146 68 12 328 132 Bad 51 14  
## 313 6.80 137 117 5 337 135 Bad 38 10  
## 314 9.33 103 81 3 491 54 Medium 66 13  
## 315 7.72 133 33 10 333 129 Good 71 14  
## 316 6.39 131 21 8 220 171 Good 29 14  
## 317 15.63 122 36 5 369 72 Good 35 10  
## 318 6.41 142 30 0 472 136 Good 80 15  
## 319 10.08 116 72 10 456 130 Good 41 14  
## 320 6.97 127 45 19 459 129 Medium 57 11  
## 321 5.86 136 70 12 171 152 Medium 44 18  
## 322 7.52 123 39 5 499 98 Medium 34 15  
## 323 9.16 140 50 10 300 139 Good 60 15  
## 324 10.36 107 105 18 428 103 Medium 34 12  
## 325 2.66 136 65 4 133 150 Bad 53 13  
## 326 11.70 144 69 11 131 104 Medium 47 11  
## 327 4.69 133 30 0 152 122 Medium 53 17  
## 328 6.23 112 38 17 316 104 Medium 80 16  
## 329 3.15 117 66 1 65 111 Bad 55 11  
## 330 11.27 100 54 9 433 89 Good 45 12  
## 331 4.99 122 59 0 501 112 Bad 32 14  
## 332 10.10 135 63 15 213 134 Medium 32 10  
## 333 5.74 106 33 20 354 104 Medium 61 12  
## 334 5.87 136 60 7 303 147 Medium 41 10  
## 335 7.63 93 117 9 489 83 Bad 42 13  
## 336 6.18 120 70 15 464 110 Medium 72 15  
## 337 5.17 138 35 6 60 143 Bad 28 18  
## 338 8.61 130 38 0 283 102 Medium 80 15  
## 339 5.97 112 24 0 164 101 Medium 45 11  
## 340 11.54 134 44 4 219 126 Good 44 15  
## 341 7.50 140 29 0 105 91 Bad 43 16  
## 342 7.38 98 120 0 268 93 Medium 72 10  
## 343 7.81 137 102 13 422 118 Medium 71 10  
## 344 5.99 117 42 10 371 121 Bad 26 14  
## 345 8.43 138 80 0 108 126 Good 70 13  
## 346 4.81 121 68 0 279 149 Good 79 12  
## 347 8.97 132 107 0 144 125 Medium 33 13  
## 348 6.88 96 39 0 161 112 Good 27 14  
## 349 12.57 132 102 20 459 107 Good 49 11  
## 350 9.32 134 27 18 467 96 Medium 49 14  
## 351 8.64 NA 101 17 266 91 Medium 63 17  
## 352 10.44 124 115 16 458 105 Medium 62 16  
## 353 13.44 133 103 14 288 122 Good 61 17  
## 354 9.45 107 67 12 430 92 Medium 35 12  
## 355 5.30 133 31 1 80 145 Medium 42 18  
## 356 7.02 130 100 0 306 146 Good 42 11  
## 357 3.58 142 109 0 111 164 Good 72 12  
## 358 13.36 103 73 3 276 72 Medium 34 15  
## 359 4.17 123 96 10 71 118 Bad 69 11  
## 360 3.13 130 62 11 396 130 Bad 66 14  
## 361 8.77 118 86 7 265 114 Good 52 15  
## 362 8.68 131 25 10 183 104 Medium 56 15  
## 363 5.25 131 55 0 26 110 Bad 79 12  
## 364 10.26 111 75 1 377 108 Good 25 12  
## 365 10.50 122 21 16 488 131 Good 30 14  
## 366 6.53 154 30 0 122 162 Medium 57 17  
## 367 5.98 124 56 11 447 134 53 12  
## 368 14.37 95 106 0 256 53 Good 52 17  
## 369 10.71 109 22 10 348 79 Good 74 14  
## 370 10.26 135 100 22 463 122 Medium 36 14  
## 371 7.68 126 41 22 403 119 Bad 42 12  
## 372 9.08 152 81 0 191 126 Medium 54 16  
## 373 7.80 121 50 0 508 98 Medium 65 11  
## 374 5.58 137 71 0 402 116 Medium 78 17  
## 375 9.44 131 47 7 90 118 Medium 47 12  
## 376 7.90 132 46 4 206 124 Medium 73 11  
## 377 16.27 141 60 19 319 92 Good 44 11  
## 378 6.81 132 61 0 263 125 Medium 41 12  
## 379 6.11 133 88 3 105 119 Medium 79 12  
## 380 5.81 125 111 0 404 107 Bad 54 15  
## 381 9.64 106 64 NA 17 89 Medium 68 17  
## 382 3.90 124 65 21 496 151 Bad 77 13  
## 383 4.95 121 28 19 315 121 Medium 66 14  
## 384 9.35 98 117 0 76 68 Medium 63 10  
## 385 12.85 123 37 15 348 112 Good 28 12  
## 386 5.87 131 73 13 455 132 Medium 62 17  
## 387 5.32 152 116 0 170 160 Medium 39 16  
## 388 8.67 142 73 14 238 115 Medium 73 14  
## 389 8.14 135 89 11 245 78 Bad 79 16  
## 390 8.44 128 42 8 328 107 Medium 35 12  
## 391 5.47 108 75 9 61 111 Medium 67 12  
## 392 6.10 153 63 0 49 124 Bad 56 16  
## 393 4.53 129 42 13 315 130 Bad 34 13  
## 394 5.57 109 51 10 26 120 Medium 30 17  
## 395 5.35 130 58 19 366 139 Bad 33 16  
## 396 12.57 138 108 17 203 128 Good 33 14  
## 397 6.14 139 23 3 37 120 Medium 55 11  
## 398 7.41 162 26 12 368 159 Medium 40 18  
## 399 5.94 100 79 7 284 95 Bad 50 12  
## 400 9.71 134 37 0 27 120 Good 49 16  
## Urban US profit  
## 1 Yes Yes 62  
## 2 Yes Yes 32  
## 3 Yes Yes 25  
## 4 Yes Yes 96  
## 5 Yes No 61  
## 6 No Yes 100  
## 7 Yes No 105  
## 8 Yes Yes 66  
## 9 No No 110  
## 10 No Yes 113  
## 11 No Yes 69  
## 12 Yes Yes 90  
## 13 Yes No 33  
## 14 Yes Yes 17  
## 15 Yes Yes 106  
## 16 No No 90  
## 17 Yes No 32  
## 18 Yes Yes 61  
## 19 No Yes 110  
## 20 Yes Yes 60  
## 21 Yes Yes 88  
## 22 No Yes 17  
## 23 Yes No 40  
## 24 Yes No 31  
## 25 Yes Yes 103  
## 26 No No 32  
## 27 No Yes 104  
## 28 Yes No 118  
## 29 Yes Yes 74  
## 30 Yes Yes 84  
## 31 Yes No 94  
## 32 Yes Yes 42  
## 33 No Yes 20  
## 34 Yes Yes 25  
## 35 Yes Yes 54  
## 36 No Yes 73  
## 37 No No 76  
## 38 Yes Yes 36  
## 39 Yes No 73  
## 40 No No 60  
## 41 No No 98  
## 42 Yes No 53  
## 43 Yes No 69  
## 44 Yes Yes 31  
## 45 Yes Yes 73  
## 46 Yes Yes 63  
## 47 No Yes 76  
## 48 Yes No 98  
## 49 Yes No 52  
## 50 Yes No 93  
## 51 Yes Yes 14  
## 52 Yes No 90  
## 53 Yes Yes 37  
## 54 Yes Yes 51  
## 55 No Yes 90  
## 56 Yes Yes 76  
## 57 Yes No 82  
## 58 Yes No 91  
## 59 Yes Yes 78  
## 60 Yes No 67  
## 61 Yes Yes 83  
## 62 No No 32  
## 63 Yes Yes 45  
## 64 Yes Yes 78  
## 65 No Yes 55  
## 66 No No 26  
## 67 Yes No 92  
## 68 Yes Yes 47  
## 69 Yes Yes 49  
## 70 Yes No 59  
## 71 Yes Yes 66  
## 72 No Yes 35  
## 73 Yes No 45  
## 74 No Yes 80  
## 75 No Yes 63  
## 76 No Yes 88  
## 77 Yes Yes 77  
## 78 No Yes 59  
## 79 Yes Yes 47  
## 80 Yes No 67  
## 81 Yes Yes 84  
## 82 Yes No 72  
## 83 Yes Yes 79  
## 84 Yes Yes 29  
## 85 No No 25  
## 86 No No 103  
## 87 Yes No 75  
## 88 No Yes 60  
## 89 Yes Yes 35  
## 90 No No 63  
## 91 No No 22  
## 92 Yes Yes 35  
## 93 Yes No 113  
## 94 Yes No 30  
## 95 Yes Yes 92  
## 96 Yes Yes 15  
## 97 No Yes 32  
## 98 Yes Yes 77  
## 99 No Yes 53  
## 100 No Yes 44  
## 101 No Yes 58  
## 102 Yes No 93  
## 103 No No 22  
## 104 Yes Yes 91  
## 105 Yes No 96  
## 106 Yes Yes 92  
## 107 No No 33  
## 108 Yes No 107  
## 109 Yes No 77  
## 110 No No 65  
## 111 Yes Yes 55  
## 112 Yes Yes 106  
## 113 Yes Yes 94  
## 114 Yes Yes 18  
## 115 Yes Yes 78  
## 116 Yes No 35  
## 117 No No 75  
## 118 Yes No 53  
## 119 Yes Yes 86  
## 120 Yes Yes 86  
## 121 Yes Yes 94  
## 122 Yes Yes 79  
## 123 Yes Yes 95  
## 124 No Yes 103  
## 125 Yes No 113  
## 126 No No 78  
## 127 Yes Yes 66  
## 128 Yes Yes 45  
## 129 Yes Yes 97  
## 130 No Yes 113  
## 131 Yes Yes 71  
## 132 Yes No 66  
## 133 Yes Yes 78  
## 134 Yes Yes 96  
## 135 Yes No 31  
## 136 No Yes 80  
## 137 No No 75  
## 138 Yes No 42  
## 139 Yes Yes 91  
## 140 No Yes 52  
## 141 Yes Yes 50  
## 142 Yes No 42  
## 143 Yes No 84  
## 144 Yes Yes 81  
## 145 No No 68  
## 146 Yes Yes 52  
## 147 Yes No 83  
## 148 No Yes 45  
## 149 No Yes 119  
## 150 Yes Yes 107  
## 151 No Yes 76  
## 152 No Yes 41  
## 153 No No 78  
## 154 No Yes 29  
## 155 No Yes 59  
## 156 Yes No 72  
## 157 Yes No 34  
## 158 No Yes 50  
## 159 No Yes 89  
## 160 No No 60  
## 161 No No 28  
## 162 No Yes 16  
## 163 Yes No 74  
## 164 No No 64  
## 165 No Yes 64  
## 166 Yes Yes 51  
## 167 Yes Yes 50  
## 168 Yes No 73  
## 169 Yes No 89  
## 170 Yes Yes 26  
## 171 Yes Yes 27  
## 172 Yes Yes 94  
## 173 Yes Yes 89  
## 174 Yes Yes 86  
## 175 No No 24  
## 176 Yes No 89  
## 177 No Yes 98  
## 178 Yes Yes 72  
## 179 No Yes 57  
## 180 Yes Yes 22  
## 181 Yes Yes 97  
## 182 Yes No 83  
## 183 Yes No 56  
## 184 Yes Yes 68  
## 185 No Yes 26  
## 186 Yes Yes 89  
## 187 No No 51  
## 188 Yes No 32  
## 189 Yes No 37  
## 190 No Yes 99  
## 191 No Yes 24  
## 192 Yes Yes 29  
## 193 No No 26  
## 194 Yes Yes 63  
## 195 Yes Yes 80  
## 196 Yes Yes 89  
## 197 Yes Yes 22  
## 198 Yes No 61  
## 199 Yes Yes 75  
## 200 Yes Yes 83  
## 201 No No 92  
## 202 Yes No 83  
## 203 No Yes 74  
## 204 Yes No 82  
## 205 Yes No 80  
## 206 Yes No 21  
## 207 Yes Yes 67  
## 208 No No 105  
## 209 Yes No 54  
## 210 No Yes 10  
## 211 No Yes 39  
## 212 Yes Yes 104  
## 213 Yes Yes 50  
## 214 Yes Yes 79  
## 215 Yes Yes 112  
## 216 Yes Yes 68  
## 217 Yes No 33  
## 218 No No 44  
## 219 Yes Yes 49  
## 220 Yes Yes 60  
## 221 Yes Yes 105  
## 222 Yes No 44  
## 223 Yes Yes 113  
## 224 Yes Yes 36  
## 225 No No 82  
## 226 Yes No 25  
## 227 Yes No 33  
## 228 Yes Yes 54  
## 229 No Yes 60  
## 230 No No 104  
## 231 No No 60  
## 232 No No 69  
## 233 Yes Yes 70  
## 234 No Yes 58  
## 235 No Yes 51  
## 236 Yes Yes 24  
## 237 Yes Yes 18  
## 238 Yes Yes 20  
## 239 Yes No 24  
## 240 Yes Yes 105  
## 241 Yes No 80  
## 242 Yes No 63  
## 243 No No 46  
## 244 Yes Yes 12  
## 245 Yes No 30  
## 246 No Yes 43  
## 247 Yes Yes 36  
## 248 Yes No 114  
## 249 Yes Yes 52  
## 250 Yes No 67  
## 251 Yes Yes 95  
## 252 Yes Yes 106  
## 253 Yes No 97  
## 254 No Yes 19  
## 255 Yes Yes 81  
## 256 Yes Yes 73  
## 257 Yes No 40  
## 258 Yes Yes 48  
## 259 No No 38  
## 260 No Yes 26  
## 261 Yes Yes 109  
## 262 Yes Yes 38  
## 263 Yes Yes 62  
## 264 Yes Yes 20  
## 265 Yes Yes 24  
## 266 Yes Yes 25  
## 267 No Yes 81  
## 268 No Yes 75  
## 269 Yes No 57  
## 270 Yes No 69  
## 271 Yes No 26  
## 272 Yes No 56  
## 273 Yes No 33  
## 274 Yes Yes 98  
## 275 Yes Yes 91  
## 276 Yes Yes 108  
## 277 Yes Yes 55  
## 278 Yes Yes 36  
## 279 No Yes 111  
## 280 Yes Yes 44  
## 281 Yes Yes 76  
## 282 No Yes 62  
## 283 Yes No 96  
## 284 No No 110  
## 285 No No 35  
## 286 Yes Yes 15  
## 287 No Yes 107  
## 288 Yes Yes 40  
## 289 No No 40  
## 290 Yes Yes 52  
## 291 No Yes 97  
## 292 Yes No 70  
## 293 Yes Yes 50  
## 294 Yes No 84  
## 295 Yes Yes 73  
## 296 No Yes 21  
## 297 Yes Yes 31  
## 298 Yes Yes 70  
## 299 Yes No 63  
## 300 No Yes 23  
## 301 Yes Yes 77  
## 302 Yes Yes 93  
## 303 Yes Yes 64  
## 304 Yes Yes 36  
## 305 Yes Yes 86  
## 306 Yes Yes 3  
## 307 Yes Yes 31  
## 308 Yes No 92  
## 309 Yes Yes 61  
## 310 Yes Yes 98  
## 311 Yes Yes 36  
## 312 Yes Yes 56  
## 313 Yes Yes 112  
## 314 Yes No 78  
## 315 Yes Yes 23  
## 316 Yes Yes 13  
## 317 Yes Yes 31  
## 318 No No 30  
## 319 No Yes 62  
## 320 No Yes 26  
## 321 Yes Yes 58  
## 322 Yes No 34  
## 323 Yes Yes 40  
## 324 Yes Yes 87  
## 325 Yes Yes 61  
## 326 Yes Yes 58  
## 327 Yes No 30  
## 328 Yes Yes 21  
## 329 Yes Yes 65  
## 330 Yes Yes 45  
## 331 No No 59  
## 332 Yes Yes 48  
## 333 Yes Yes 13  
## 334 Yes Yes 53  
## 335 Yes Yes 108  
## 336 Yes Yes 55  
## 337 Yes No 29  
## 338 Yes No 38  
## 339 Yes No 24  
## 340 Yes Yes 40  
## 341 Yes No 29  
## 342 No No 120  
## 343 No Yes 89  
## 344 Yes Yes 32  
## 345 No Yes 80  
## 346 Yes No 68  
## 347 No No 107  
## 348 No No 39  
## 349 Yes Yes 82  
## 350 No Yes 9  
## 351 No Yes 84  
## 352 No Yes 99  
## 353 Yes Yes 89  
## 354 No Yes 55  
## 355 Yes Yes 30  
## 356 Yes No 100  
## 357 No 109  
## 358 Yes Yes 70  
## 359 Yes Yes 86  
## 360 Yes Yes 51  
## 361 No Yes 79  
## 362 No Yes 15  
## 363 Yes Yes 55  
## 364 Yes No 74  
## 365 Yes Yes 5  
## 366 No No 30  
## 367 No Yes 45  
## 368 Yes No 106  
## 369 No Yes 12  
## 370 Yes Yes 78  
## 371 Yes Yes 19  
## 372 Yes No 81  
## 373 No No 50  
## 374 Yes No 71  
## 375 Yes Yes 40  
## 376 Yes No 42  
## 377 Yes Yes 41  
## 378 No No 61  
## 379 Yes Yes 85  
## 380 Yes No 111  
## 381 Yes Yes NA  
## 382 Yes Yes 44  
## 383 Yes Yes 9  
## 384 Yes No 117  
## 385 Yes Yes 22  
## 386 Yes Yes 60  
## 387 Yes No 116  
## 388 No Yes 59  
## 389 Yes Yes 78  
## 390 Yes Yes 34  
## 391 Yes Yes 66  
## 392 Yes No 63  
## 393 Yes Yes 29  
## 394 No Yes 41  
## 395 Yes Yes 39  
## 396 Yes Yes 91  
## 397 No Yes 20  
## 398 Yes Yes 14  
## 399 Yes Yes 72  
## 400 Yes Yes 37

## d) Check for missing data. If you have missing data remove the corresponding rows from the dataset.

#Here removing missing values

table(is.na(data))

##   
## FALSE TRUE   
## 4797 3

data=na.omit(data)  
data

## Sales CompPrice Income Advertising Population Price ShelveLoc Age Education  
## 1 9.50 138 73 11 276 120 Bad 42 17  
## 2 11.22 111 48 16 260 83 Good 65 10  
## 3 10.06 113 35 10 269 80 Medium 59 12  
## 4 7.40 117 100 4 466 97 Medium 55 14  
## 5 4.15 141 64 3 340 128 Bad 38 13  
## 6 10.81 124 113 13 501 72 Bad 78 16  
## 7 6.63 115 105 0 45 108 Medium 71 15  
## 8 11.85 136 81 15 425 120 Good 67 10  
## 9 6.54 132 110 0 108 124 Medium 76 10  
## 10 4.69 132 113 0 131 124 Medium 76 17  
## 11 9.01 121 78 9 150 100 Bad 26 10  
## 12 11.96 117 94 4 503 94 Good 50 13  
## 13 3.98 122 35 2 393 136 Medium 62 18  
## 14 10.96 115 28 11 29 86 Good 53 18  
## 15 11.17 107 117 11 148 118 Good 52 18  
## 16 8.71 149 95 5 400 144 Medium 76 18  
## 17 7.58 118 32 0 284 110 Good 63 13  
## 18 12.29 147 74 13 251 131 Good 52 10  
## 19 13.91 110 110 0 408 68 Good 46 17  
## 20 8.73 129 76 16 58 121 Medium 69 12  
## 21 6.41 125 90 2 367 131 Medium 35 18  
## 22 12.13 134 29 12 239 109 Good 62 18  
## 23 5.08 128 46 6 497 138 Medium 42 13  
## 24 5.87 121 31 0 292 109 Medium 79 10  
## 25 10.14 145 119 16 294 113 Bad 42 12  
## 26 14.90 139 32 0 176 82 Good 54 11  
## 27 8.33 107 115 11 496 131 Good 50 11  
## 28 5.27 98 118 0 19 107 Medium 64 17  
## 29 2.99 103 74 0 359 97 Bad 55 11  
## 30 7.81 104 99 15 226 102 Bad 58 17  
## 31 13.55 125 94 0 447 89 Good 30 12  
## 32 8.25 136 58 16 241 131 Medium 44 18  
## 33 6.20 107 32 12 236 137 Good 64 10  
## 34 8.77 114 38 13 317 128 Good 50 16  
## 35 2.67 115 54 0 406 128 Medium 42 17  
## 36 11.07 131 84 11 29 96 Medium 44 17  
## 37 8.89 122 76 0 270 100 Good 60 18  
## 38 4.95 121 41 5 412 110 Medium 54 10  
## 39 6.59 109 73 0 454 102 Medium 65 15  
## 40 3.24 130 60 0 144 138 Bad 38 10  
## 41 2.07 119 98 0 18 126 Bad 73 17  
## 42 7.96 157 53 0 403 124 Bad 58 16  
## 43 10.43 77 69 0 25 24 Medium 50 18  
## 44 4.12 123 42 11 16 134 Medium 59 13  
## 45 4.16 85 79 6 325 95 Medium 69 13  
## 46 4.56 141 63 0 168 135 Bad 44 12  
## 47 12.44 127 90 14 16 70 Medium 48 15  
## 48 4.38 126 98 0 173 108 Bad 55 16  
## 49 3.91 116 52 0 349 98 Bad 69 18  
## 50 10.61 157 93 0 51 149 Good 32 17  
## 51 1.42 99 32 18 341 108 Bad 80 16  
## 52 4.42 121 90 0 150 108 Bad 75 16  
## 53 7.91 153 40 3 112 129 Bad 39 18  
## 54 6.92 109 64 13 39 119 Medium 61 17  
## 55 4.90 134 103 13 25 144 Medium 76 17  
## 56 6.85 143 81 5 60 154 Medium 61 18  
## 57 11.91 133 82 0 54 84 Medium 50 17  
## 58 0.91 93 91 0 22 117 Bad 75 11  
## 59 5.42 103 93 15 188 103 Bad 74 16  
## 60 5.21 118 71 4 148 114 Medium 80 13  
## 61 8.32 122 102 19 469 123 Bad 29 13  
## 62 7.32 105 32 0 358 107 Medium 26 13  
## 63 1.82 139 45 0 146 133 Bad 77 17  
## 64 8.47 119 88 10 170 101 Medium 61 13  
## 65 7.80 100 67 12 184 104 Medium 32 16  
## 66 4.90 122 26 0 197 128 Medium 55 13  
## 67 8.85 127 92 0 508 91 Medium 56 18  
## 68 9.01 126 61 14 152 115 Medium 47 16  
## 69 13.39 149 69 20 366 134 Good 60 13  
## 70 7.99 127 59 0 339 99 Medium 65 12  
## 71 9.46 89 81 15 237 99 Good 74 12  
## 72 6.50 148 51 16 148 150 Medium 58 17  
## 73 5.52 115 45 0 432 116 Medium 25 15  
## 74 12.61 118 90 10 54 104 Good 31 11  
## 75 6.20 150 68 5 125 136 Medium 64 13  
## 76 8.55 88 111 23 480 92 Bad 36 16  
## 77 10.64 102 87 10 346 70 Medium 64 15  
## 78 7.70 118 71 12 44 89 Medium 67 18  
## 79 4.43 134 48 1 139 145 Medium 65 12  
## 80 9.14 134 67 0 286 90 Bad 41 13  
## 81 8.01 113 100 16 353 79 Bad 68 11  
## 82 7.52 116 72 0 237 128 Good 70 13  
## 83 11.62 151 83 4 325 139 Good 28 17  
## 84 4.42 109 36 7 468 94 Bad 56 11  
## 85 2.23 111 25 0 52 121 Bad 43 18  
## 86 8.47 125 103 0 304 112 Medium 49 13  
## 87 8.70 150 84 9 432 134 Medium 64 15  
## 88 11.70 131 67 7 272 126 Good 54 16  
## 89 6.56 117 42 7 144 111 Medium 62 10  
## 90 7.95 128 66 3 493 119 Medium 45 16  
## 91 5.33 115 22 0 491 103 Medium 64 11  
## 92 4.81 97 46 11 267 107 Medium 80 15  
## 93 4.53 114 113 0 97 125 Medium 29 12  
## 94 8.86 145 30 0 67 104 Medium 55 17  
## 95 8.39 115 97 5 134 84 Bad 55 11  
## 96 5.58 134 25 10 237 148 Medium 59 13  
## 97 9.48 147 42 10 407 132 Good 73 16  
## 98 7.45 161 82 5 287 129 Bad 33 16  
## 99 12.49 122 77 24 382 127 Good 36 16  
## 100 4.88 121 47 3 220 107 Bad 56 16  
## 101 4.11 113 69 11 94 106 Medium 76 12  
## 102 6.20 128 93 0 89 118 Medium 34 18  
## 103 5.30 113 22 0 57 97 Medium 65 16  
## 104 5.07 123 91 0 334 96 Bad 78 17  
## 105 4.62 121 96 0 472 138 Medium 51 12  
## 106 5.55 104 100 8 398 97 Medium 61 11  
## 107 0.16 102 33 0 217 139 Medium 70 18  
## 108 8.55 134 107 0 104 108 Medium 60 12  
## 109 3.47 107 79 2 488 103 Bad 65 16  
## 110 8.98 115 65 0 217 90 Medium 60 17  
## 111 9.00 128 62 7 125 116 Medium 43 14  
## 112 6.62 132 118 12 272 151 Medium 43 14  
## 113 6.67 116 99 5 298 125 Good 62 12  
## 114 6.01 131 29 11 335 127 Bad 33 12  
## 115 9.31 122 87 9 17 106 Medium 65 13  
## 116 8.54 139 35 0 95 129 Medium 42 13  
## 117 5.08 135 75 0 202 128 Medium 80 10  
## 118 8.80 145 53 0 507 119 Medium 41 12  
## 119 7.57 112 88 2 243 99 Medium 62 11  
## 120 7.37 130 94 8 137 128 Medium 64 12  
## 121 6.87 128 105 11 249 131 Medium 63 13  
## 122 11.67 125 89 10 380 87 Bad 28 10  
## 123 6.88 119 100 5 45 108 Medium 75 10  
## 124 8.19 127 103 0 125 155 Good 29 15  
## 125 8.87 131 113 0 181 120 Good 63 14  
## 126 9.34 89 78 0 181 49 Medium 43 15  
## 127 11.27 153 68 2 60 133 Good 59 16  
## 128 6.52 125 48 3 192 116 Medium 51 14  
## 129 4.96 133 100 3 350 126 Bad 55 13  
## 130 4.47 143 120 7 279 147 Bad 40 10  
## 131 8.41 94 84 13 497 77 Medium 51 12  
## 132 6.50 108 69 3 208 94 Medium 77 16  
## 133 9.54 125 87 9 232 136 Good 72 10  
## 134 7.62 132 98 2 265 97 Bad 62 12  
## 135 3.67 132 31 0 327 131 Medium 76 16  
## 136 6.44 96 94 14 384 120 Medium 36 18  
## 137 5.17 131 75 0 10 120 Bad 31 18  
## 138 6.52 128 42 0 436 118 Medium 80 11  
## 139 10.27 125 103 12 371 109 Medium 44 10  
## 140 12.30 146 62 10 310 94 Medium 30 13  
## 141 6.03 133 60 10 277 129 Medium 45 18  
## 142 6.53 140 42 0 331 131 Bad 28 15  
## 143 7.44 124 84 0 300 104 Medium 77 15  
## 144 0.53 122 88 7 36 159 Bad 28 17  
## 145 9.09 132 68 0 264 123 Good 34 11  
## 146 8.77 144 63 11 27 117 Medium 47 17  
## 147 3.90 114 83 0 412 131 Bad 39 14  
## 148 10.51 140 54 9 402 119 Good 41 16  
## 149 7.56 110 119 0 384 97 Medium 72 14  
## 150 11.48 121 120 13 140 87 Medium 56 11  
## 151 10.49 122 84 8 176 114 Good 57 10  
## 152 10.77 111 58 17 407 103 Good 75 17  
## 153 7.64 128 78 0 341 128 Good 45 13  
## 154 5.93 150 36 7 488 150 Medium 25 17  
## 155 6.89 129 69 10 289 110 Medium 50 16  
## 156 7.71 98 72 0 59 69 Medium 65 16  
## 157 7.49 146 34 0 220 157 Good 51 16  
## 158 10.21 121 58 8 249 90 Medium 48 13  
## 159 12.53 142 90 1 189 112 Good 39 10  
## 160 9.32 119 60 0 372 70 Bad 30 18  
## 161 4.67 111 28 0 486 111 Medium 29 12  
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## 163 3.63 122 74 0 424 149 Medium 51 13  
## 164 5.68 130 64 0 40 106 Bad 39 17  
## 165 8.22 148 64 0 58 141 Medium 27 13  
## 166 0.37 147 58 7 100 191 Bad 27 15  
## 167 6.71 119 67 17 151 137 Medium 55 11  
## 168 6.71 106 73 0 216 93 Medium 60 13  
## 169 7.30 129 89 0 425 117 Medium 45 10  
## 170 11.48 104 41 15 492 77 Good 73 18  
## 171 8.01 128 39 12 356 118 Medium 71 10  
## 172 12.49 93 106 12 416 55 Medium 75 15  
## 173 9.03 104 102 13 123 110 Good 35 16  
## 174 6.38 135 91 5 207 128 Medium 66 18  
## 175 0.00 139 24 0 358 185 Medium 79 15  
## 176 7.54 115 89 0 38 122 Medium 25 12  
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## 185 9.95 132 33 7 35 97 Medium 60 11  
## 186 10.07 130 100 11 449 107 Medium 64 10  
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## 188 6.03 117 32 0 142 96 Bad 62 17  
## 189 8.07 116 37 0 426 90 Medium 76 15  
## 190 12.11 118 117 18 509 104 Medium 26 15  
## 191 8.79 130 37 13 297 101 Medium 37 13  
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## 193 7.56 108 26 0 408 93 Medium 56 14  
## 194 13.28 139 70 7 71 96 Good 61 10  
## 195 7.23 112 98 18 481 128 Medium 45 11  
## 196 4.19 117 93 4 420 112 Bad 66 11  
## 197 4.10 130 28 6 410 133 Bad 72 16  
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## 199 3.62 112 80 5 500 128 Medium 69 10  
## 200 6.42 122 88 5 335 126 Medium 64 14  
## 201 5.56 144 92 0 349 146 Medium 62 12  
## 202 5.94 138 83 0 139 134 Medium 54 18  
## 203 4.10 121 78 4 413 130 Bad 46 10  
## 204 2.05 131 82 0 132 157 Bad 25 14  
## 205 8.74 155 80 0 237 124 Medium 37 14  
## 206 5.68 113 22 1 317 132 Medium 28 12  
## 207 4.97 162 67 0 27 160 Medium 77 17  
## 208 8.19 111 105 0 466 97 Bad 61 10  
## 209 7.78 86 54 0 497 64 Bad 33 12  
## 210 3.02 98 21 11 326 90 Bad 76 11  
## 211 4.36 125 41 2 357 123 Bad 47 14  
## 212 9.39 117 118 14 445 120 Medium 32 15  
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## 238 9.62 151 28 8 499 135 Medium 48 10  
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## 254 5.64 124 24 5 288 122 Medium 57 12  
## 255 9.58 108 104 23 353 129 Good 37 17  
## 256 7.71 123 81 8 198 81 Bad 80 15  
## 257 4.20 147 40 0 277 144 Medium 73 10  
## 258 8.67 125 62 14 477 112 Medium 80 13  
## 259 3.47 108 38 0 251 81 Bad 72 14  
## 260 5.12 123 36 10 467 100 Bad 74 11  
## 261 7.67 129 117 8 400 101 Bad 36 10  
## 262 5.71 121 42 4 188 118 Medium 54 15  
## 263 6.37 120 77 15 86 132 Medium 48 18  
## 264 7.77 116 26 6 434 115 Medium 25 17  
## 265 6.95 128 29 5 324 159 Good 31 15  
## 266 5.31 130 35 10 402 129 Bad 39 17  
## 267 9.10 128 93 12 343 112 Good 73 17  
## 268 5.83 134 82 7 473 112 Bad 51 12  
## 269 6.53 123 57 0 66 105 Medium 39 11  
## 270 5.01 159 69 0 438 166 Medium 46 17  
## 271 11.99 119 26 0 284 89 Good 26 10  
## 272 4.55 111 56 0 504 110 Medium 62 16  
## 273 12.98 113 33 0 14 63 Good 38 12  
## 274 10.04 116 106 8 244 86 Medium 58 12  
## 275 7.22 135 93 2 67 119 Medium 34 11  
## 276 6.67 107 119 11 210 132 Medium 53 11  
## 277 6.93 135 69 14 296 130 Medium 73 15  
## 278 7.80 136 48 12 326 125 Medium 36 16  
## 279 7.22 114 113 2 129 151 Good 40 15  
## 280 3.42 141 57 13 376 158 Medium 64 18  
## 281 2.86 121 86 10 496 145 Bad 51 10  
## 282 11.19 122 69 7 303 105 Good 45 16  
## 283 7.74 150 96 0 80 154 Good 61 11  
## 284 5.36 135 110 0 112 117 Medium 80 16  
## 285 6.97 106 46 11 414 96 Bad 79 17  
## 286 7.60 146 26 11 261 131 Medium 39 10  
## 287 7.53 117 118 11 429 113 Medium 67 18  
## 288 6.88 95 44 4 208 72 Bad 44 17  
## 289 6.98 116 40 0 74 97 Medium 76 15  
## 290 8.75 143 77 25 448 156 Medium 43 17  
## 291 9.49 107 111 14 400 103 Medium 41 11  
## 292 6.64 118 70 0 106 89 Bad 39 17  
## 293 11.82 113 66 16 322 74 Good 76 15  
## 294 11.28 123 84 0 74 89 Good 59 10  
## 295 12.66 148 76 3 126 99 Good 60 11  
## 296 4.21 118 35 14 502 137 Medium 79 10  
## 297 8.21 127 44 13 160 123 Good 63 18  
## 298 3.07 118 83 13 276 104 Bad 75 10  
## 299 10.98 148 63 0 312 130 Good 63 15  
## 300 9.40 135 40 17 497 96 Medium 54 17  
## 301 8.57 116 78 1 158 99 Medium 45 11  
## 302 7.41 99 93 0 198 87 Medium 57 16  
## 303 5.28 108 77 13 388 110 Bad 74 14  
## 304 10.01 133 52 16 290 99 Medium 43 11  
## 305 11.93 123 98 12 408 134 Good 29 10  
## 306 8.03 115 29 26 394 132 Medium 33 13  
## 307 4.78 131 32 1 85 133 Medium 48 12  
## 308 5.90 138 92 0 13 120 Bad 61 12  
## 309 9.24 126 80 19 436 126 Medium 52 10  
## 310 11.18 131 111 13 33 80 Bad 68 18  
## 311 9.53 175 65 29 419 166 Medium 53 12  
## 312 6.15 146 68 12 328 132 Bad 51 14  
## 313 6.80 137 117 5 337 135 Bad 38 10  
## 314 9.33 103 81 3 491 54 Medium 66 13  
## 315 7.72 133 33 10 333 129 Good 71 14  
## 316 6.39 131 21 8 220 171 Good 29 14  
## 317 15.63 122 36 5 369 72 Good 35 10  
## 318 6.41 142 30 0 472 136 Good 80 15  
## 319 10.08 116 72 10 456 130 Good 41 14  
## 320 6.97 127 45 19 459 129 Medium 57 11  
## 321 5.86 136 70 12 171 152 Medium 44 18  
## 322 7.52 123 39 5 499 98 Medium 34 15  
## 323 9.16 140 50 10 300 139 Good 60 15  
## 324 10.36 107 105 18 428 103 Medium 34 12  
## 325 2.66 136 65 4 133 150 Bad 53 13  
## 326 11.70 144 69 11 131 104 Medium 47 11  
## 327 4.69 133 30 0 152 122 Medium 53 17  
## 328 6.23 112 38 17 316 104 Medium 80 16  
## 329 3.15 117 66 1 65 111 Bad 55 11  
## 330 11.27 100 54 9 433 89 Good 45 12  
## 331 4.99 122 59 0 501 112 Bad 32 14  
## 332 10.10 135 63 15 213 134 Medium 32 10  
## 333 5.74 106 33 20 354 104 Medium 61 12  
## 334 5.87 136 60 7 303 147 Medium 41 10  
## 335 7.63 93 117 9 489 83 Bad 42 13  
## 336 6.18 120 70 15 464 110 Medium 72 15  
## 337 5.17 138 35 6 60 143 Bad 28 18  
## 338 8.61 130 38 0 283 102 Medium 80 15  
## 339 5.97 112 24 0 164 101 Medium 45 11  
## 340 11.54 134 44 4 219 126 Good 44 15  
## 341 7.50 140 29 0 105 91 Bad 43 16  
## 342 7.38 98 120 0 268 93 Medium 72 10  
## 343 7.81 137 102 13 422 118 Medium 71 10  
## 344 5.99 117 42 10 371 121 Bad 26 14  
## 345 8.43 138 80 0 108 126 Good 70 13  
## 346 4.81 121 68 0 279 149 Good 79 12  
## 347 8.97 132 107 0 144 125 Medium 33 13  
## 348 6.88 96 39 0 161 112 Good 27 14  
## 349 12.57 132 102 20 459 107 Good 49 11  
## 350 9.32 134 27 18 467 96 Medium 49 14  
## 352 10.44 124 115 16 458 105 Medium 62 16  
## 353 13.44 133 103 14 288 122 Good 61 17  
## 354 9.45 107 67 12 430 92 Medium 35 12  
## 355 5.30 133 31 1 80 145 Medium 42 18  
## 356 7.02 130 100 0 306 146 Good 42 11  
## 357 3.58 142 109 0 111 164 Good 72 12  
## 358 13.36 103 73 3 276 72 Medium 34 15  
## 359 4.17 123 96 10 71 118 Bad 69 11  
## 360 3.13 130 62 11 396 130 Bad 66 14  
## 361 8.77 118 86 7 265 114 Good 52 15  
## 362 8.68 131 25 10 183 104 Medium 56 15  
## 363 5.25 131 55 0 26 110 Bad 79 12  
## 364 10.26 111 75 1 377 108 Good 25 12  
## 365 10.50 122 21 16 488 131 Good 30 14  
## 366 6.53 154 30 0 122 162 Medium 57 17  
## 367 5.98 124 56 11 447 134 53 12  
## 368 14.37 95 106 0 256 53 Good 52 17  
## 369 10.71 109 22 10 348 79 Good 74 14  
## 370 10.26 135 100 22 463 122 Medium 36 14  
## 371 7.68 126 41 22 403 119 Bad 42 12  
## 372 9.08 152 81 0 191 126 Medium 54 16  
## 373 7.80 121 50 0 508 98 Medium 65 11  
## 374 5.58 137 71 0 402 116 Medium 78 17  
## 375 9.44 131 47 7 90 118 Medium 47 12  
## 376 7.90 132 46 4 206 124 Medium 73 11  
## 377 16.27 141 60 19 319 92 Good 44 11  
## 378 6.81 132 61 0 263 125 Medium 41 12  
## 379 6.11 133 88 3 105 119 Medium 79 12  
## 380 5.81 125 111 0 404 107 Bad 54 15  
## 382 3.90 124 65 21 496 151 Bad 77 13  
## 383 4.95 121 28 19 315 121 Medium 66 14  
## 384 9.35 98 117 0 76 68 Medium 63 10  
## 385 12.85 123 37 15 348 112 Good 28 12  
## 386 5.87 131 73 13 455 132 Medium 62 17  
## 387 5.32 152 116 0 170 160 Medium 39 16  
## 388 8.67 142 73 14 238 115 Medium 73 14  
## 389 8.14 135 89 11 245 78 Bad 79 16  
## 390 8.44 128 42 8 328 107 Medium 35 12  
## 391 5.47 108 75 9 61 111 Medium 67 12  
## 392 6.10 153 63 0 49 124 Bad 56 16  
## 393 4.53 129 42 13 315 130 Bad 34 13  
## 394 5.57 109 51 10 26 120 Medium 30 17  
## 395 5.35 130 58 19 366 139 Bad 33 16  
## 396 12.57 138 108 17 203 128 Good 33 14  
## 397 6.14 139 23 3 37 120 Medium 55 11  
## 398 7.41 162 26 12 368 159 Medium 40 18  
## 399 5.94 100 79 7 284 95 Bad 50 12  
## 400 9.71 134 37 0 27 120 Good 49 16  
## Urban US profit  
## 1 Yes Yes 62  
## 2 Yes Yes 32  
## 3 Yes Yes 25  
## 4 Yes Yes 96  
## 5 Yes No 61  
## 6 No Yes 100  
## 7 Yes No 105  
## 8 Yes Yes 66  
## 9 No No 110  
## 10 No Yes 113  
## 11 No Yes 69  
## 12 Yes Yes 90  
## 13 Yes No 33  
## 14 Yes Yes 17  
## 15 Yes Yes 106  
## 16 No No 90  
## 17 Yes No 32  
## 18 Yes Yes 61  
## 19 No Yes 110  
## 20 Yes Yes 60  
## 21 Yes Yes 88  
## 22 No Yes 17  
## 23 Yes No 40  
## 24 Yes No 31  
## 25 Yes Yes 103  
## 26 No No 32  
## 27 No Yes 104  
## 28 Yes No 118  
## 29 Yes Yes 74  
## 30 Yes Yes 84  
## 31 Yes No 94  
## 32 Yes Yes 42  
## 33 No Yes 20  
## 34 Yes Yes 25  
## 35 Yes Yes 54  
## 36 No Yes 73  
## 37 No No 76  
## 38 Yes Yes 36  
## 39 Yes No 73  
## 40 No No 60  
## 41 No No 98  
## 42 Yes No 53  
## 43 Yes No 69  
## 44 Yes Yes 31  
## 45 Yes Yes 73  
## 46 Yes Yes 63  
## 47 No Yes 76  
## 48 Yes No 98  
## 49 Yes No 52  
## 50 Yes No 93  
## 51 Yes Yes 14  
## 52 Yes No 90  
## 53 Yes Yes 37  
## 54 Yes Yes 51  
## 55 No Yes 90  
## 56 Yes Yes 76  
## 57 Yes No 82  
## 58 Yes No 91  
## 59 Yes Yes 78  
## 60 Yes No 67  
## 61 Yes Yes 83  
## 62 No No 32  
## 63 Yes Yes 45  
## 64 Yes Yes 78  
## 65 No Yes 55  
## 66 No No 26  
## 67 Yes No 92  
## 68 Yes Yes 47  
## 69 Yes Yes 49  
## 70 Yes No 59  
## 71 Yes Yes 66  
## 72 No Yes 35  
## 73 Yes No 45  
## 74 No Yes 80  
## 75 No Yes 63  
## 76 No Yes 88  
## 77 Yes Yes 77  
## 78 No Yes 59  
## 79 Yes Yes 47  
## 80 Yes No 67  
## 81 Yes Yes 84  
## 82 Yes No 72  
## 83 Yes Yes 79  
## 84 Yes Yes 29  
## 85 No No 25  
## 86 No No 103  
## 87 Yes No 75  
## 88 No Yes 60  
## 89 Yes Yes 35  
## 90 No No 63  
## 91 No No 22  
## 92 Yes Yes 35  
## 93 Yes No 113  
## 94 Yes No 30  
## 95 Yes Yes 92  
## 96 Yes Yes 15  
## 97 No Yes 32  
## 98 Yes Yes 77  
## 99 No Yes 53  
## 100 No Yes 44  
## 101 No Yes 58  
## 102 Yes No 93  
## 103 No No 22  
## 104 Yes Yes 91  
## 105 Yes No 96  
## 106 Yes Yes 92  
## 107 No No 33  
## 108 Yes No 107  
## 109 Yes No 77  
## 110 No No 65  
## 111 Yes Yes 55  
## 112 Yes Yes 106  
## 113 Yes Yes 94  
## 114 Yes Yes 18  
## 115 Yes Yes 78  
## 116 Yes No 35  
## 117 No No 75  
## 118 Yes No 53  
## 119 Yes Yes 86  
## 120 Yes Yes 86  
## 121 Yes Yes 94  
## 122 Yes Yes 79  
## 123 Yes Yes 95  
## 124 No Yes 103  
## 125 Yes No 113  
## 126 No No 78  
## 127 Yes Yes 66  
## 128 Yes Yes 45  
## 129 Yes Yes 97  
## 130 No Yes 113  
## 131 Yes Yes 71  
## 132 Yes No 66  
## 133 Yes Yes 78  
## 134 Yes Yes 96  
## 135 Yes No 31  
## 136 No Yes 80  
## 137 No No 75  
## 138 Yes No 42  
## 139 Yes Yes 91  
## 140 No Yes 52  
## 141 Yes Yes 50  
## 142 Yes No 42  
## 143 Yes No 84  
## 144 Yes Yes 81  
## 145 No No 68  
## 146 Yes Yes 52  
## 147 Yes No 83  
## 148 No Yes 45  
## 149 No Yes 119  
## 150 Yes Yes 107  
## 151 No Yes 76  
## 152 No Yes 41  
## 153 No No 78  
## 154 No Yes 29  
## 155 No Yes 59  
## 156 Yes No 72  
## 157 Yes No 34  
## 158 No Yes 50  
## 159 No Yes 89  
## 160 No No 60  
## 161 No No 28  
## 162 No Yes 16  
## 163 Yes No 74  
## 164 No No 64  
## 165 No Yes 64  
## 166 Yes Yes 51  
## 167 Yes Yes 50  
## 168 Yes No 73  
## 169 Yes No 89  
## 170 Yes Yes 26  
## 171 Yes Yes 27  
## 172 Yes Yes 94  
## 173 Yes Yes 89  
## 174 Yes Yes 86  
## 175 No No 24  
## 176 Yes No 89  
## 177 No Yes 98  
## 178 Yes Yes 72  
## 179 No Yes 57  
## 180 Yes Yes 22  
## 181 Yes Yes 97  
## 182 Yes No 83  
## 183 Yes No 56  
## 184 Yes Yes 68  
## 185 No Yes 26  
## 186 Yes Yes 89  
## 187 No No 51  
## 188 Yes No 32  
## 189 Yes No 37  
## 190 No Yes 99  
## 191 No Yes 24  
## 192 Yes Yes 29  
## 193 No No 26  
## 194 Yes Yes 63  
## 195 Yes Yes 80  
## 196 Yes Yes 89  
## 197 Yes Yes 22  
## 198 Yes No 61  
## 199 Yes Yes 75  
## 200 Yes Yes 83  
## 201 No No 92  
## 202 Yes No 83  
## 203 No Yes 74  
## 204 Yes No 82  
## 205 Yes No 80  
## 206 Yes No 21  
## 207 Yes Yes 67  
## 208 No No 105  
## 209 Yes No 54  
## 210 No Yes 10  
## 211 No Yes 39  
## 212 Yes Yes 104  
## 213 Yes Yes 50  
## 214 Yes Yes 79  
## 215 Yes Yes 112  
## 216 Yes Yes 68  
## 217 Yes No 33  
## 218 No No 44  
## 219 Yes Yes 49  
## 220 Yes Yes 60  
## 221 Yes Yes 105  
## 222 Yes No 44  
## 223 Yes Yes 113  
## 224 Yes Yes 36  
## 225 No No 82  
## 226 Yes No 25  
## 227 Yes No 33  
## 228 Yes Yes 54  
## 229 No Yes 60  
## 230 No No 104  
## 231 No No 60  
## 232 No No 69  
## 233 Yes Yes 70  
## 234 No Yes 58  
## 235 No Yes 51  
## 236 Yes Yes 24  
## 237 Yes Yes 18  
## 238 Yes Yes 20  
## 239 Yes No 24  
## 240 Yes Yes 105  
## 241 Yes No 80  
## 242 Yes No 63  
## 243 No No 46  
## 244 Yes Yes 12  
## 245 Yes No 30  
## 246 No Yes 43  
## 247 Yes Yes 36  
## 248 Yes No 114  
## 249 Yes Yes 52  
## 250 Yes No 67  
## 251 Yes Yes 95  
## 252 Yes Yes 106  
## 253 Yes No 97  
## 254 No Yes 19  
## 255 Yes Yes 81  
## 256 Yes Yes 73  
## 257 Yes No 40  
## 258 Yes Yes 48  
## 259 No No 38  
## 260 No Yes 26  
## 261 Yes Yes 109  
## 262 Yes Yes 38  
## 263 Yes Yes 62  
## 264 Yes Yes 20  
## 265 Yes Yes 24  
## 266 Yes Yes 25  
## 267 No Yes 81  
## 268 No Yes 75  
## 269 Yes No 57  
## 270 Yes No 69  
## 271 Yes No 26  
## 272 Yes No 56  
## 273 Yes No 33  
## 274 Yes Yes 98  
## 275 Yes Yes 91  
## 276 Yes Yes 108  
## 277 Yes Yes 55  
## 278 Yes Yes 36  
## 279 No Yes 111  
## 280 Yes Yes 44  
## 281 Yes Yes 76  
## 282 No Yes 62  
## 283 Yes No 96  
## 284 No No 110  
## 285 No No 35  
## 286 Yes Yes 15  
## 287 No Yes 107  
## 288 Yes Yes 40  
## 289 No No 40  
## 290 Yes Yes 52  
## 291 No Yes 97  
## 292 Yes No 70  
## 293 Yes Yes 50  
## 294 Yes No 84  
## 295 Yes Yes 73  
## 296 No Yes 21  
## 297 Yes Yes 31  
## 298 Yes Yes 70  
## 299 Yes No 63  
## 300 No Yes 23  
## 301 Yes Yes 77  
## 302 Yes Yes 93  
## 303 Yes Yes 64  
## 304 Yes Yes 36  
## 305 Yes Yes 86  
## 306 Yes Yes 3  
## 307 Yes Yes 31  
## 308 Yes No 92  
## 309 Yes Yes 61  
## 310 Yes Yes 98  
## 311 Yes Yes 36  
## 312 Yes Yes 56  
## 313 Yes Yes 112  
## 314 Yes No 78  
## 315 Yes Yes 23  
## 316 Yes Yes 13  
## 317 Yes Yes 31  
## 318 No No 30  
## 319 No Yes 62  
## 320 No Yes 26  
## 321 Yes Yes 58  
## 322 Yes No 34  
## 323 Yes Yes 40  
## 324 Yes Yes 87  
## 325 Yes Yes 61  
## 326 Yes Yes 58  
## 327 Yes No 30  
## 328 Yes Yes 21  
## 329 Yes Yes 65  
## 330 Yes Yes 45  
## 331 No No 59  
## 332 Yes Yes 48  
## 333 Yes Yes 13  
## 334 Yes Yes 53  
## 335 Yes Yes 108  
## 336 Yes Yes 55  
## 337 Yes No 29  
## 338 Yes No 38  
## 339 Yes No 24  
## 340 Yes Yes 40  
## 341 Yes No 29  
## 342 No No 120  
## 343 No Yes 89  
## 344 Yes Yes 32  
## 345 No Yes 80  
## 346 Yes No 68  
## 347 No No 107  
## 348 No No 39  
## 349 Yes Yes 82  
## 350 No Yes 9  
## 352 No Yes 99  
## 353 Yes Yes 89  
## 354 No Yes 55  
## 355 Yes Yes 30  
## 356 Yes No 100  
## 357 No 109  
## 358 Yes Yes 70  
## 359 Yes Yes 86  
## 360 Yes Yes 51  
## 361 No Yes 79  
## 362 No Yes 15  
## 363 Yes Yes 55  
## 364 Yes No 74  
## 365 Yes Yes 5  
## 366 No No 30  
## 367 No Yes 45  
## 368 Yes No 106  
## 369 No Yes 12  
## 370 Yes Yes 78  
## 371 Yes Yes 19  
## 372 Yes No 81  
## 373 No No 50  
## 374 Yes No 71  
## 375 Yes Yes 40  
## 376 Yes No 42  
## 377 Yes Yes 41  
## 378 No No 61  
## 379 Yes Yes 85  
## 380 Yes No 111  
## 382 Yes Yes 44  
## 383 Yes Yes 9  
## 384 Yes No 117  
## 385 Yes Yes 22  
## 386 Yes Yes 60  
## 387 Yes No 116  
## 388 No Yes 59  
## 389 Yes Yes 78  
## 390 Yes Yes 34  
## 391 Yes Yes 66  
## 392 Yes No 63  
## 393 Yes Yes 29  
## 394 No Yes 41  
## 395 Yes Yes 39  
## 396 Yes Yes 91  
## 397 No Yes 20  
## 398 Yes Yes 14  
## 399 Yes Yes 72  
## 400 Yes Yes 37

## e) How many “Good” shelving locations are there in the dataset?

data=subset(data,data$ShelveLoc == "Good")  
data

## Sales CompPrice Income Advertising Population Price ShelveLoc Age Education  
## 2 11.22 111 48 16 260 83 Good 65 10  
## 8 11.85 136 81 15 425 120 Good 67 10  
## 12 11.96 117 94 4 503 94 Good 50 13  
## 14 10.96 115 28 11 29 86 Good 53 18  
## 15 11.17 107 117 11 148 118 Good 52 18  
## 17 7.58 118 32 0 284 110 Good 63 13  
## 18 12.29 147 74 13 251 131 Good 52 10  
## 19 13.91 110 110 0 408 68 Good 46 17  
## 22 12.13 134 29 12 239 109 Good 62 18  
## 26 14.90 139 32 0 176 82 Good 54 11  
## 27 8.33 107 115 11 496 131 Good 50 11  
## 31 13.55 125 94 0 447 89 Good 30 12  
## 33 6.20 107 32 12 236 137 Good 64 10  
## 34 8.77 114 38 13 317 128 Good 50 16  
## 37 8.89 122 76 0 270 100 Good 60 18  
## 50 10.61 157 93 0 51 149 Good 32 17  
## 69 13.39 149 69 20 366 134 Good 60 13  
## 71 9.46 89 81 15 237 99 Good 74 12  
## 74 12.61 118 90 10 54 104 Good 31 11  
## 82 7.52 116 72 0 237 128 Good 70 13  
## 83 11.62 151 83 4 325 139 Good 28 17  
## 88 11.70 131 67 7 272 126 Good 54 16  
## 97 9.48 147 42 10 407 132 Good 73 16  
## 99 12.49 122 77 24 382 127 Good 36 16  
## 113 6.67 116 99 5 298 125 Good 62 12  
## 124 8.19 127 103 0 125 155 Good 29 15  
## 125 8.87 131 113 0 181 120 Good 63 14  
## 127 11.27 153 68 2 60 133 Good 59 16  
## 133 9.54 125 87 9 232 136 Good 72 10  
## 145 9.09 132 68 0 264 123 Good 34 11  
## 148 10.51 140 54 9 402 119 Good 41 16  
## 151 10.49 122 84 8 176 114 Good 57 10  
## 152 10.77 111 58 17 407 103 Good 75 17  
## 153 7.64 128 78 0 341 128 Good 45 13  
## 157 7.49 146 34 0 220 157 Good 51 16  
## 159 12.53 142 90 1 189 112 Good 39 10  
## 170 11.48 104 41 15 492 77 Good 73 18  
## 173 9.03 104 102 13 123 110 Good 35 16  
## 192 6.67 156 42 13 170 173 Good 74 14  
## 194 13.28 139 70 7 71 96 Good 61 10  
## 220 10.62 116 79 19 359 116 Good 58 17  
## 227 7.80 119 33 0 245 122 Good 56 14  
## 233 13.14 137 80 10 24 105 Good 61 15  
## 235 9.43 115 62 11 289 129 Good 56 16  
## 239 7.36 121 24 0 200 133 Good 73 13  
## 246 10.00 114 43 0 199 88 Good 57 10  
## 251 9.16 137 105 10 435 156 Good 72 14  
## 255 9.58 108 104 23 353 129 Good 37 17  
## 265 6.95 128 29 5 324 159 Good 31 15  
## 267 9.10 128 93 12 343 112 Good 73 17  
## 271 11.99 119 26 0 284 89 Good 26 10  
## 273 12.98 113 33 0 14 63 Good 38 12  
## 279 7.22 114 113 2 129 151 Good 40 15  
## 282 11.19 122 69 7 303 105 Good 45 16  
## 283 7.74 150 96 0 80 154 Good 61 11  
## 293 11.82 113 66 16 322 74 Good 76 15  
## 294 11.28 123 84 0 74 89 Good 59 10  
## 295 12.66 148 76 3 126 99 Good 60 11  
## 297 8.21 127 44 13 160 123 Good 63 18  
## 299 10.98 148 63 0 312 130 Good 63 15  
## 305 11.93 123 98 12 408 134 Good 29 10  
## 315 7.72 133 33 10 333 129 Good 71 14  
## 316 6.39 131 21 8 220 171 Good 29 14  
## 317 15.63 122 36 5 369 72 Good 35 10  
## 318 6.41 142 30 0 472 136 Good 80 15  
## 319 10.08 116 72 10 456 130 Good 41 14  
## 323 9.16 140 50 10 300 139 Good 60 15  
## 330 11.27 100 54 9 433 89 Good 45 12  
## 340 11.54 134 44 4 219 126 Good 44 15  
## 345 8.43 138 80 0 108 126 Good 70 13  
## 346 4.81 121 68 0 279 149 Good 79 12  
## 348 6.88 96 39 0 161 112 Good 27 14  
## 349 12.57 132 102 20 459 107 Good 49 11  
## 353 13.44 133 103 14 288 122 Good 61 17  
## 356 7.02 130 100 0 306 146 Good 42 11  
## 357 3.58 142 109 0 111 164 Good 72 12  
## 361 8.77 118 86 7 265 114 Good 52 15  
## 364 10.26 111 75 1 377 108 Good 25 12  
## 365 10.50 122 21 16 488 131 Good 30 14  
## 368 14.37 95 106 0 256 53 Good 52 17  
## 369 10.71 109 22 10 348 79 Good 74 14  
## 377 16.27 141 60 19 319 92 Good 44 11  
## 385 12.85 123 37 15 348 112 Good 28 12  
## 396 12.57 138 108 17 203 128 Good 33 14  
## 400 9.71 134 37 0 27 120 Good 49 16  
## Urban US profit  
## 2 Yes Yes 32  
## 8 Yes Yes 66  
## 12 Yes Yes 90  
## 14 Yes Yes 17  
## 15 Yes Yes 106  
## 17 Yes No 32  
## 18 Yes Yes 61  
## 19 No Yes 110  
## 22 No Yes 17  
## 26 No No 32  
## 27 No Yes 104  
## 31 Yes No 94  
## 33 No Yes 20  
## 34 Yes Yes 25  
## 37 No No 76  
## 50 Yes No 93  
## 69 Yes Yes 49  
## 71 Yes Yes 66  
## 74 No Yes 80  
## 82 Yes No 72  
## 83 Yes Yes 79  
## 88 No Yes 60  
## 97 No Yes 32  
## 99 No Yes 53  
## 113 Yes Yes 94  
## 124 No Yes 103  
## 125 Yes No 113  
## 127 Yes Yes 66  
## 133 Yes Yes 78  
## 145 No No 68  
## 148 No Yes 45  
## 151 No Yes 76  
## 152 No Yes 41  
## 153 No No 78  
## 157 Yes No 34  
## 159 No Yes 89  
## 170 Yes Yes 26  
## 173 Yes Yes 89  
## 192 Yes Yes 29  
## 194 Yes Yes 63  
## 220 Yes Yes 60  
## 227 Yes No 33  
## 233 Yes Yes 70  
## 235 No Yes 51  
## 239 Yes No 24  
## 246 No Yes 43  
## 251 Yes Yes 95  
## 255 Yes Yes 81  
## 265 Yes Yes 24  
## 267 No Yes 81  
## 271 Yes No 26  
## 273 Yes No 33  
## 279 No Yes 111  
## 282 No Yes 62  
## 283 Yes No 96  
## 293 Yes Yes 50  
## 294 Yes No 84  
## 295 Yes Yes 73  
## 297 Yes Yes 31  
## 299 Yes No 63  
## 305 Yes Yes 86  
## 315 Yes Yes 23  
## 316 Yes Yes 13  
## 317 Yes Yes 31  
## 318 No No 30  
## 319 No Yes 62  
## 323 Yes Yes 40  
## 330 Yes Yes 45  
## 340 Yes Yes 40  
## 345 No Yes 80  
## 346 Yes No 68  
## 348 No No 39  
## 349 Yes Yes 82  
## 353 Yes Yes 89  
## 356 Yes No 100  
## 357 No 109  
## 361 No Yes 79  
## 364 Yes No 74  
## 365 Yes Yes 5  
## 368 Yes No 106  
## 369 No Yes 12  
## 377 Yes Yes 41  
## 385 Yes Yes 22  
## 396 Yes Yes 91  
## 400 Yes Yes 37

nrow(data)

## [1] 85

## f) How many stores are inside the USA? create a separate data frame containing all stores from USA.Name the data set as “stores\_USA”

stores\_USA = subset(data, data$US == "Yes")  
stores\_USA

## Sales CompPrice Income Advertising Population Price ShelveLoc Age Education  
## 2 11.22 111 48 16 260 83 Good 65 10  
## 8 11.85 136 81 15 425 120 Good 67 10  
## 12 11.96 117 94 4 503 94 Good 50 13  
## 14 10.96 115 28 11 29 86 Good 53 18  
## 15 11.17 107 117 11 148 118 Good 52 18  
## 18 12.29 147 74 13 251 131 Good 52 10  
## 19 13.91 110 110 0 408 68 Good 46 17  
## 22 12.13 134 29 12 239 109 Good 62 18  
## 27 8.33 107 115 11 496 131 Good 50 11  
## 33 6.20 107 32 12 236 137 Good 64 10  
## 34 8.77 114 38 13 317 128 Good 50 16  
## 69 13.39 149 69 20 366 134 Good 60 13  
## 71 9.46 89 81 15 237 99 Good 74 12  
## 74 12.61 118 90 10 54 104 Good 31 11  
## 83 11.62 151 83 4 325 139 Good 28 17  
## 88 11.70 131 67 7 272 126 Good 54 16  
## 97 9.48 147 42 10 407 132 Good 73 16  
## 99 12.49 122 77 24 382 127 Good 36 16  
## 113 6.67 116 99 5 298 125 Good 62 12  
## 124 8.19 127 103 0 125 155 Good 29 15  
## 127 11.27 153 68 2 60 133 Good 59 16  
## 133 9.54 125 87 9 232 136 Good 72 10  
## 148 10.51 140 54 9 402 119 Good 41 16  
## 151 10.49 122 84 8 176 114 Good 57 10  
## 152 10.77 111 58 17 407 103 Good 75 17  
## 159 12.53 142 90 1 189 112 Good 39 10  
## 170 11.48 104 41 15 492 77 Good 73 18  
## 173 9.03 104 102 13 123 110 Good 35 16  
## 192 6.67 156 42 13 170 173 Good 74 14  
## 194 13.28 139 70 7 71 96 Good 61 10  
## 220 10.62 116 79 19 359 116 Good 58 17  
## 233 13.14 137 80 10 24 105 Good 61 15  
## 235 9.43 115 62 11 289 129 Good 56 16  
## 246 10.00 114 43 0 199 88 Good 57 10  
## 251 9.16 137 105 10 435 156 Good 72 14  
## 255 9.58 108 104 23 353 129 Good 37 17  
## 265 6.95 128 29 5 324 159 Good 31 15  
## 267 9.10 128 93 12 343 112 Good 73 17  
## 279 7.22 114 113 2 129 151 Good 40 15  
## 282 11.19 122 69 7 303 105 Good 45 16  
## 293 11.82 113 66 16 322 74 Good 76 15  
## 295 12.66 148 76 3 126 99 Good 60 11  
## 297 8.21 127 44 13 160 123 Good 63 18  
## 305 11.93 123 98 12 408 134 Good 29 10  
## 315 7.72 133 33 10 333 129 Good 71 14  
## 316 6.39 131 21 8 220 171 Good 29 14  
## 317 15.63 122 36 5 369 72 Good 35 10  
## 319 10.08 116 72 10 456 130 Good 41 14  
## 323 9.16 140 50 10 300 139 Good 60 15  
## 330 11.27 100 54 9 433 89 Good 45 12  
## 340 11.54 134 44 4 219 126 Good 44 15  
## 345 8.43 138 80 0 108 126 Good 70 13  
## 349 12.57 132 102 20 459 107 Good 49 11  
## 353 13.44 133 103 14 288 122 Good 61 17  
## 361 8.77 118 86 7 265 114 Good 52 15  
## 365 10.50 122 21 16 488 131 Good 30 14  
## 369 10.71 109 22 10 348 79 Good 74 14  
## 377 16.27 141 60 19 319 92 Good 44 11  
## 385 12.85 123 37 15 348 112 Good 28 12  
## 396 12.57 138 108 17 203 128 Good 33 14  
## 400 9.71 134 37 0 27 120 Good 49 16  
## Urban US profit  
## 2 Yes Yes 32  
## 8 Yes Yes 66  
## 12 Yes Yes 90  
## 14 Yes Yes 17  
## 15 Yes Yes 106  
## 18 Yes Yes 61  
## 19 No Yes 110  
## 22 No Yes 17  
## 27 No Yes 104  
## 33 No Yes 20  
## 34 Yes Yes 25  
## 69 Yes Yes 49  
## 71 Yes Yes 66  
## 74 No Yes 80  
## 83 Yes Yes 79  
## 88 No Yes 60  
## 97 No Yes 32  
## 99 No Yes 53  
## 113 Yes Yes 94  
## 124 No Yes 103  
## 127 Yes Yes 66  
## 133 Yes Yes 78  
## 148 No Yes 45  
## 151 No Yes 76  
## 152 No Yes 41  
## 159 No Yes 89  
## 170 Yes Yes 26  
## 173 Yes Yes 89  
## 192 Yes Yes 29  
## 194 Yes Yes 63  
## 220 Yes Yes 60  
## 233 Yes Yes 70  
## 235 No Yes 51  
## 246 No Yes 43  
## 251 Yes Yes 95  
## 255 Yes Yes 81  
## 265 Yes Yes 24  
## 267 No Yes 81  
## 279 No Yes 111  
## 282 No Yes 62  
## 293 Yes Yes 50  
## 295 Yes Yes 73  
## 297 Yes Yes 31  
## 305 Yes Yes 86  
## 315 Yes Yes 23  
## 316 Yes Yes 13  
## 317 Yes Yes 31  
## 319 No Yes 62  
## 323 Yes Yes 40  
## 330 Yes Yes 45  
## 340 Yes Yes 40  
## 345 No Yes 80  
## 349 Yes Yes 82  
## 353 Yes Yes 89  
## 361 No Yes 79  
## 365 Yes Yes 5  
## 369 No Yes 12  
## 377 Yes Yes 41  
## 385 Yes Yes 22  
## 396 Yes Yes 91  
## 400 Yes Yes 37

nrow(stores\_USA)

## [1] 61

## g) create another data set called “HighUrban\_USSales” using ‘stores\_USA’ data set. Where, sales are greater than 7 thousand and stores are located in Urban areas.

HighUrban\_USSales = subset(stores\_USA, Sales>7 & Urban == "Yes")  
HighUrban\_USSales

## Sales CompPrice Income Advertising Population Price ShelveLoc Age Education  
## 2 11.22 111 48 16 260 83 Good 65 10  
## 8 11.85 136 81 15 425 120 Good 67 10  
## 12 11.96 117 94 4 503 94 Good 50 13  
## 14 10.96 115 28 11 29 86 Good 53 18  
## 15 11.17 107 117 11 148 118 Good 52 18  
## 18 12.29 147 74 13 251 131 Good 52 10  
## 34 8.77 114 38 13 317 128 Good 50 16  
## 69 13.39 149 69 20 366 134 Good 60 13  
## 71 9.46 89 81 15 237 99 Good 74 12  
## 83 11.62 151 83 4 325 139 Good 28 17  
## 127 11.27 153 68 2 60 133 Good 59 16  
## 133 9.54 125 87 9 232 136 Good 72 10  
## 170 11.48 104 41 15 492 77 Good 73 18  
## 173 9.03 104 102 13 123 110 Good 35 16  
## 194 13.28 139 70 7 71 96 Good 61 10  
## 220 10.62 116 79 19 359 116 Good 58 17  
## 233 13.14 137 80 10 24 105 Good 61 15  
## 251 9.16 137 105 10 435 156 Good 72 14  
## 255 9.58 108 104 23 353 129 Good 37 17  
## 293 11.82 113 66 16 322 74 Good 76 15  
## 295 12.66 148 76 3 126 99 Good 60 11  
## 297 8.21 127 44 13 160 123 Good 63 18  
## 305 11.93 123 98 12 408 134 Good 29 10  
## 315 7.72 133 33 10 333 129 Good 71 14  
## 317 15.63 122 36 5 369 72 Good 35 10  
## 323 9.16 140 50 10 300 139 Good 60 15  
## 330 11.27 100 54 9 433 89 Good 45 12  
## 340 11.54 134 44 4 219 126 Good 44 15  
## 349 12.57 132 102 20 459 107 Good 49 11  
## 353 13.44 133 103 14 288 122 Good 61 17  
## 365 10.50 122 21 16 488 131 Good 30 14  
## 377 16.27 141 60 19 319 92 Good 44 11  
## 385 12.85 123 37 15 348 112 Good 28 12  
## 396 12.57 138 108 17 203 128 Good 33 14  
## 400 9.71 134 37 0 27 120 Good 49 16  
## Urban US profit  
## 2 Yes Yes 32  
## 8 Yes Yes 66  
## 12 Yes Yes 90  
## 14 Yes Yes 17  
## 15 Yes Yes 106  
## 18 Yes Yes 61  
## 34 Yes Yes 25  
## 69 Yes Yes 49  
## 71 Yes Yes 66  
## 83 Yes Yes 79  
## 127 Yes Yes 66  
## 133 Yes Yes 78  
## 170 Yes Yes 26  
## 173 Yes Yes 89  
## 194 Yes Yes 63  
## 220 Yes Yes 60  
## 233 Yes Yes 70  
## 251 Yes Yes 95  
## 255 Yes Yes 81  
## 293 Yes Yes 50  
## 295 Yes Yes 73  
## 297 Yes Yes 31  
## 305 Yes Yes 86  
## 315 Yes Yes 23  
## 317 Yes Yes 31  
## 323 Yes Yes 40  
## 330 Yes Yes 45  
## 340 Yes Yes 40  
## 349 Yes Yes 82  
## 353 Yes Yes 89  
## 365 Yes Yes 5  
## 377 Yes Yes 41  
## 385 Yes Yes 22  
## 396 Yes Yes 91  
## 400 Yes Yes 37

## h) Remove “US” and “Urban” columns from the “HighUrban\_USSales” dataset.

HighUrban\_USSales2 = HighUrban\_USSales[,-c(10,11)]  
HighUrban\_USSales2

## Sales CompPrice Income Advertising Population Price ShelveLoc Age Education  
## 2 11.22 111 48 16 260 83 Good 65 10  
## 8 11.85 136 81 15 425 120 Good 67 10  
## 12 11.96 117 94 4 503 94 Good 50 13  
## 14 10.96 115 28 11 29 86 Good 53 18  
## 15 11.17 107 117 11 148 118 Good 52 18  
## 18 12.29 147 74 13 251 131 Good 52 10  
## 34 8.77 114 38 13 317 128 Good 50 16  
## 69 13.39 149 69 20 366 134 Good 60 13  
## 71 9.46 89 81 15 237 99 Good 74 12  
## 83 11.62 151 83 4 325 139 Good 28 17  
## 127 11.27 153 68 2 60 133 Good 59 16  
## 133 9.54 125 87 9 232 136 Good 72 10  
## 170 11.48 104 41 15 492 77 Good 73 18  
## 173 9.03 104 102 13 123 110 Good 35 16  
## 194 13.28 139 70 7 71 96 Good 61 10  
## 220 10.62 116 79 19 359 116 Good 58 17  
## 233 13.14 137 80 10 24 105 Good 61 15  
## 251 9.16 137 105 10 435 156 Good 72 14  
## 255 9.58 108 104 23 353 129 Good 37 17  
## 293 11.82 113 66 16 322 74 Good 76 15  
## 295 12.66 148 76 3 126 99 Good 60 11  
## 297 8.21 127 44 13 160 123 Good 63 18  
## 305 11.93 123 98 12 408 134 Good 29 10  
## 315 7.72 133 33 10 333 129 Good 71 14  
## 317 15.63 122 36 5 369 72 Good 35 10  
## 323 9.16 140 50 10 300 139 Good 60 15  
## 330 11.27 100 54 9 433 89 Good 45 12  
## 340 11.54 134 44 4 219 126 Good 44 15  
## 349 12.57 132 102 20 459 107 Good 49 11  
## 353 13.44 133 103 14 288 122 Good 61 17  
## 365 10.50 122 21 16 488 131 Good 30 14  
## 377 16.27 141 60 19 319 92 Good 44 11  
## 385 12.85 123 37 15 348 112 Good 28 12  
## 396 12.57 138 108 17 203 128 Good 33 14  
## 400 9.71 134 37 0 27 120 Good 49 16  
## profit  
## 2 32  
## 8 66  
## 12 90  
## 14 17  
## 15 106  
## 18 61  
## 34 25  
## 69 49  
## 71 66  
## 83 79  
## 127 66  
## 133 78  
## 170 26  
## 173 89  
## 194 63  
## 220 60  
## 233 70  
## 251 95  
## 255 81  
## 293 50  
## 295 73  
## 297 31  
## 305 86  
## 315 23  
## 317 31  
## 323 40  
## 330 45  
## 340 40  
## 349 82  
## 353 89  
## 365 5  
## 377 41  
## 385 22  
## 396 91  
## 400 37

## i) For one the above subset, write to a new CSV file

write.csv(data,'/Users/trsaivarun/Desktop/R programs/lab assignments/carseats\_pure.csv', row.names = F)

Q2) See the following code of a function and explain what it does. Suggest a suitable name for the function and rename. Demonstrate how the function works when you have numerical data and character data. function1 <- function(x) { if (length(x) <= 1) return(NULL) x[-length(x)] }

1. The following function takes “x” as parameter and then it checks for its length, and if the length is less than or equal to 1 then it returns NULL value. Or else, it removes that last character from the variable and returns the remaining part of it.

cutter <- function(x) {  
if (length(x) <= 1) return(NULL)  
x[-length(x)]  
}  
  
digits = c(1,2,3,4,5)  
letters = c("Benz","Toyota","BMW")  
  
res1 = cutter(digits)  
cat(res1)

## 1 2 3 4

res2 = cutter(letters)  
cat(res2)

## Benz Toyota

Q3) Write a function to compute the sample variance of a numerical vector. Use the equation of the variance to write the function.

sample\_v <- function(var) {  
 if(length(var) <= 1) {  
 cat("length is less than 1")  
 }  
   
 square = sum((var-mean(var))^2)  
   
 s\_varience = square/(length(var)-1)  
 return (s\_varience)  
   
}  
  
  
data = c(6,6,6,7,8,9,2,2)  
  
res = sample\_v(data)  
cat(res)

## 6.5