# Part 1

> source('~/DS/pollutantmean.R')

> pollutantmean("specdata", "sulfate", 1:10)

[1] 4.064128

> pollutantmean("specdata", "nitrate", 23)

[1] 1.280833

Part 2

> source('~/DS/complete.R')

> complete("specdata", 1)

id nobs

1 1 117

> complete("specdata", 30:25)

id nobs

1 30 932

2 29 711

3 28 475

4 27 338

5 26 586

6 25 463

Part 3

> source('~/DS/complete.R')

> source('~/DS/corr.R')

> corr("specdata", 150)

id corr

1 2 -0.018957541

2 3 -0.140512544

3 4 -0.043897372

4 5 -0.068159562

5 6 -0.123506666

6 7 -0.075888144

7 8 -0.159673652

8 9 -0.086841940

9 11 0.763128837

10 17 -0.157828603

11 19 -0.156998919

12 21 -0.044898818

13 23 0.117249264

14 24 0.259057178

15 25 0.133274607

16 26 0.366201078

17 27 0.580751264

18 28 0.006863930

19 29 0.726693888

20 30 0.057741676

21 31 0.115338086

22 32 0.465754012

23 33 0.515804375

24 34 0.412693537

25 35 0.375631176

26 36 0.315725317

27 37 0.244560561

28 38 0.594426499

29 39 0.553514976

30 41 0.614340566

31 44 0.460513619

32 45 0.405022501

33 47 0.434789780

34 49 0.088421364

35 50 0.118136697

36 51 -0.091022820

37 52 -0.033091304

38 53 0.440660466

39 54 -0.029683708

40 55 0.268525390

41 56 0.277220958

42 57 -0.049108453

43 58 0.322627410

44 59 0.091139374

45 60 -0.025750053

46 61 0.120521602

47 62 -0.061746831

48 63 0.041306963

49 64 -0.146202136

50 66 -0.162485185

51 67 -0.097254393

52 68 0.089262856

53 71 0.568403991

54 72 0.711864008

55 74 0.268203237

56 75 0.190644585

57 76 0.227222983

58 77 0.229238882

59 78 0.005635506

60 80 0.018628108

61 83 -0.064750174

62 84 0.096614297

63 86 0.002864405

64 87 0.107184775

65 88 0.128477284

66 89 -0.042533572

67 91 -0.137041337

68 93 0.136609030

69 94 0.118975253

70 96 0.098073855

71 97 0.066928310

72 98 0.100212474

73 99 -0.063984344

74 103 -0.066525489

75 104 -0.129245884

76 105 -0.111066409

77 108 -0.089441210

78 109 -0.114090325

79 110 -0.106280702

80 111 -0.176855164

81 112 -0.116984680

82 113 0.019138583

83 114 0.100643502

84 115 -0.073858484

85 116 0.036665921

86 117 -0.107957809

87 120 0.296744105

88 121 0.347421569

89 122 0.146528765

90 123 0.362414577

91 124 0.093330832

92 125 0.198915192

93 127 0.164602262

94 128 0.180626975

95 131 0.176508543

96 132 0.139158631

97 133 0.231984399

98 136 0.227615918

99 138 0.275903634

100 139 0.299630040

101 140 0.248143145

102 141 0.298344178

103 142 -0.056325366

104 143 -0.178114558

105 144 0.002032940

106 145 -0.022802183

107 147 -0.001202233

108 148 0.085217423

109 149 -0.076409023

110 150 0.010021716

111 151 0.016411646

112 152 -0.038785934

113 153 -0.075297768

114 154 0.041917773

115 156 0.193324040

116 158 0.596929143

117 160 0.113596590

118 164 -0.143750037

119 165 -0.017703373

120 166 0.284905360

121 167 0.305506111

122 168 0.150031306

123 170 0.134895077

124 171 0.172850003

125 172 0.286076203

126 173 -0.106687748

127 174 0.244744168

128 176 0.337120085

129 177 0.424798956

130 178 0.095921881

131 179 0.022899033

132 180 0.143330735

133 181 0.087196218

134 182 0.408741028

135 183 0.425176879

136 184 0.361728434

137 185 -0.035090337

138 186 -0.082388453

139 188 -0.094742313

140 189 -0.087573726

141 190 -0.060405837

142 191 -0.092398269

143 192 -0.183197353

144 193 0.124650112

145 194 -0.053001162

146 195 -0.039911536

147 196 0.010158287

148 197 0.451828854

149 198 0.295793699

150 199 0.615268727

151 200 -0.075214053

152 201 0.132207405

153 202 0.089547098

154 203 -0.019086127

155 205 -0.045552626

156 209 0.211599525

157 210 -0.073972834

158 213 0.112668377

159 214 0.138387891

160 215 -0.003207550

161 216 -0.052643174

162 217 0.042168144

163 218 -0.067460173

164 219 -0.030882797

165 220 0.017805647

166 221 0.026138073

167 222 -0.050287543

168 223 0.016535643

169 225 0.199919014

170 227 0.482158286

171 228 0.355110474

172 229 0.589606340

173 230 0.368038099

174 231 -0.029094866

175 232 -0.074495323

176 234 0.262101561

177 239 -0.005386993

178 240 0.258826380

179 241 0.144110820

180 242 0.101915017

181 243 0.023020993

182 244 0.074594252

183 245 0.256665139

184 246 0.162401158

185 247 -0.003454405

186 248 0.190141976

187 249 0.184581239

188 250 0.120596460

189 252 -0.176233152

190 253 -0.144699131

191 254 0.147074115

192 255 0.273520382

193 257 0.109557323

194 258 -0.092863394

195 260 -0.182752126

196 262 -0.008836513

197 263 0.356592359

198 265 -0.089133895

199 266 -0.017185129

200 267 -0.156323514

201 268 -0.042538204

202 269 0.010235676

203 270 -0.009912754

204 271 -0.042910367

205 272 -0.210567709

206 273 -0.155957816

207 277 0.046211272

208 279 -0.060808231

209 287 0.160865053

210 299 0.615095781

211 300 0.598343330

212 301 0.506535631

213 302 0.191834811

214 303 -0.024723462

215 305 -0.150627164

216 306 -0.002500089

217 307 -0.166201361

218 309 0.619349867

219 310 0.531380642

220 312 0.520115665

221 313 0.466673962

222 314 0.518820173

223 315 0.394191512

224 318 0.379446208

225 320 -0.123172036

226 321 -0.061565518

227 322 -0.180133963

228 325 0.253978075

229 326 0.139867175

230 327 0.316429404

231 328 0.268780500

232 329 0.279397143

233 330 0.267260662

234 331 0.287133842

Part 4

> source('~/DS/pollutantvector.R')

> pollutantvector("specdata", "sulfate", 1:35, 0.5)

[1] 7.210 5.990 4.680 3.470 2.420 1.430 2.760 3.410 1.300 3.150 2.870 2.270 2.330 1.840 7.130 2.050

[17] 2.050 2.580 3.260 3.540 4.400 2.040 4.360 3.460 2.990 2.000 2.420 2.760 1.480 3.540 6.630 10.900

[33] 1.630 5.760 5.520 12.200 4.980 4.390 1.650 4.530 4.300 15.800 5.440 3.090 3.610 4.190 7.370 2.680

[49] 2.210 1.990 1.780 2.030 2.110 1.820 2.370 3.410 4.960 2.300 4.670 2.870 1.530 1.280 4.170 2.750

[65] 2.830 1.220 4.190 1.920 2.550 2.180 2.930 2.790 2.740 2.020 4.730 5.840 4.640 4.790 6.650 2.090

[81] 4.850 7.250 3.220 3.810 2.850 1.360 1.850 13.000 2.570 2.680 5.420 9.520 7.680 6.650 19.100 6.040

[97] 2.800 5.520 1.820 4.880 2.280 5.510 2.410 1.630 1.670 0.959 2.740 0.613 2.370 2.240 2.530 3.500

[113] 2.600 2.700 3.740 2.640 4.820 2.300 2.190 1.200 2.230 4.150 3.000 4.040 4.790 2.050 7.930 7.740

[129] 2.630 3.800 3.520 3.700 3.900 2.720 5.950 2.110 6.400 2.670 3.920 2.060 1.890 7.560 6.870 3.000

[145] 3.420 3.760 3.110 11.100 4.600 10.300 4.700 3.540 5.290 1.510 1.500 4.380 3.200 2.780 10.700 3.630

[161] 8.120 6.830 6.570 3.920 2.890 3.150 6.430 6.040 12.200 12.100 13.400 10.500 13.500 2.670 4.630 6.280

[177] 5.850 3.740 8.360 11.400 4.410 9.620 10.800 3.290 3.640 3.110 4.360 4.330 12.500 8.550 6.850 5.730

[193] 3.520 4.380 8.260 2.060 1.850 1.050 4.300 2.840 4.610 4.520 4.250 7.310 4.710 4.940 7.380 1.900

[209] 5.170 2.510 3.170 0.555 1.190 3.650 1.750 3.610 2.840 4.220 1.570 2.600 3.280 1.900 1.870 2.720

[225] 4.730 4.520 2.540 1.990 3.270 1.870 3.140 5.550 3.040 5.660 8.720 3.330 3.580 3.860 4.990 3.660

[241] 3.690 3.980 6.100 2.630 2.230 2.320 6.720 7.300 6.410 6.570 2.740 4.770 4.130 6.880 4.800 2.220

[257] 6.330 11.500 4.900 4.070 6.130 3.710 6.290 5.210 4.040 1.780 8.610 7.540 11.200 4.000 6.520 3.660

[273] 9.770 5.280 3.410 3.440 13.700 10.700 11.400 4.080 5.010 4.300 6.340 4.470 9.180 5.890 5.360 11.000

[289] 8.310 18.500 9.590 5.430 13.600 8.620 4.780 8.700 7.410 5.990 2.830 3.520 11.000 4.340 4.610 4.680

[305] 2.830 4.560 3.730 4.600 4.050 3.000 5.150 3.830 3.620 4.140 1.970 3.720 3.680 1.650 2.180 4.330

[321] 3.790 0.844 1.650 0.917 3.200 1.610 2.600 6.480 4.550 1.070 3.210 2.640 5.660 5.400 4.500 6.080

[337] 3.490 6.580 3.060 3.820 7.540 2.690 3.750 4.210 3.310 2.460 5.600 5.580 4.710 7.560 2.890 3.490

[353] 3.810 9.780 8.810 5.230 4.270 5.950 1.030 4.070 1.710 5.380 12.700 6.540 2.500 5.190 6.960 7.120

[369] 3.940 1.970 5.040 6.590 8.620 9.130 5.120 2.310 2.990 3.000 3.710 2.550 5.010 2.580 4.330 8.360

[385] 3.570 5.550 3.940 7.650 10.800 1.660 8.490 9.460 4.270 16.800 6.220 2.190 3.980 11.200 13.900 7.740

[401] 2.500 11.300 6.120 6.980 2.980 3.780 4.610 5.960 8.240 4.070 1.480 4.150 4.310 4.730 2.740 2.560

[417] 6.080 3.170 3.220 1.870 1.540 4.350 1.610 3.370 1.960 1.290 1.980 2.900 5.070 2.920 3.070 1.690

[433] 1.440 1.870 3.470 1.840 3.560 1.340 6.290 3.970 4.700 2.280 2.710 2.140 3.000 4.940 2.160 3.270

[449] 2.340 2.560 3.880 6.380 3.820 1.610 1.950 1.180 4.600 2.320 3.690 4.520 2.640 3.020 1.820 2.840

[465] 2.670 3.250 3.780 4.060 5.310 3.620 3.450 2.300 3.760 4.170 4.780 6.760 5.000 3.770 2.620 6.330

[481] 4.730 4.360 4.480 3.710 12.100 7.290 7.550 4.700 2.840 9.050 2.060 1.950 3.370 3.510 4.790 3.830

[497] 4.210 3.660 3.650 13.700 7.600 4.090 10.300 5.460 13.900 7.140 3.540 5.320 13.300 11.100 2.100 5.030

[513] 12.400 6.160 5.390 5.310 5.520 5.320 4.260 3.030 10.300 8.890 5.050 6.330 4.790 2.680 1.140 2.660

[529] 11.200 3.070 8.200 8.960 2.530 2.220 1.510 2.800 1.490 4.840 3.230 3.190 2.020 1.730 3.640 3.090

[545] 1.820 2.310 2.330 2.300 1.650 2.320 1.620 3.040 2.150 3.250 5.330 1.140 3.620 1.730 4.160 2.510

[561] 2.520 5.420 3.530 3.970 1.810 1.870 3.610 1.450 6.070 6.890 5.020 1.830 2.030 2.410 1.400 2.770

[577] 4.530 6.170 1.540 6.030 3.250 1.030 2.650 1.930 4.470 2.140 5.140 7.490 3.540 1.250 3.050 4.890

[593] 4.590 14.700 8.580 7.230 4.260 7.030 7.830 3.980 7.770 3.860 3.190 1.160 5.700 10.600 18.400 8.550

[609] 11.300 4.970 2.410 10.400 4.690 3.380 3.550 6.340 14.100 14.600 13.300 9.080 17.400 3.760 11.100 8.210

[625] 7.220 9.350 5.860 11.000 10.600 4.830 10.600 23.300 4.120 9.690 2.390 2.590 6.520 8.140 5.620 3.510

[641] 6.410 9.390 1.860 5.010 2.190 4.320 6.580 3.800 4.690 4.340 3.030 2.850 1.910 3.700 0.991 3.720

[657] 1.210 1.780 6.250 0.817 1.840 2.300 2.150 2.730 3.280 3.380 1.770 3.280 1.140 1.150 2.410 1.810

[673] 1.330 1.560 1.310 1.230 3.230 2.740 2.370 3.030 3.080 2.200 3.010 4.690 3.320 4.080 3.190 1.840

[689] 6.010 2.280 1.800 4.290 4.560 6.140 3.480 3.320 2.390 3.250 5.730 4.230 3.740 6.840 6.560 5.370

[705] 5.610 9.150 1.530 1.790 2.660 6.140 3.980 9.780 10.400 4.550 6.830 12.500 10.400 5.480 6.770 6.520

[721] 4.810 7.670 10.600 8.050 7.220 2.830 6.530 10.700 4.460 3.680 2.980 6.520 4.110 5.280 4.770 6.700

[737] 4.420 12.000 8.840 17.900 2.600 3.370 5.450 8.090 6.490 10.500 5.040 9.610 2.520 4.140 4.020 9.370

[753] 3.470 4.630 2.810 1.840 2.590 1.830 2.960 1.860 1.880 3.440 4.220 2.220 6.480 2.050 4.120 3.070

[769] 1.350 1.640 2.380 4.560 6.500 6.780 1.590 3.400 1.270 3.610 3.790 2.100 1.790 4.100 1.600 3.170

[785] 2.650 1.180 3.650 0.877 2.660 2.360 4.010 1.880 1.900 1.630 1.660 3.160 1.480 8.530 6.160 2.850

[801] 2.790 2.100 5.190 5.320 5.810 6.310 4.550 1.970 1.560 2.800 5.070 11.100 2.660 2.140 4.920 7.460

[817] 11.500 4.330 6.560 5.320 3.340 10.800 3.860 6.190 8.840 11.300 2.140 2.360 7.890 7.220 6.570 2.510

[833] 8.310 5.400 7.930 4.240 5.340 6.980 3.510 4.300 4.340 2.730 5.710 5.700 3.240 8.190 18.800 5.330

[849] 4.860 11.200 8.430 6.560 11.300 6.120 9.470 27.900 8.160 4.720 11.500 6.320 4.300 2.650 7.820 3.500

[865] 3.570 4.780 3.880 4.360 4.760 2.390 0.769 2.850 3.250 6.560 6.100 3.900 5.480 2.400 4.030 2.160

[881] 1.320 2.850 4.620 1.760 6.250 2.740 1.560 3.020 1.390 1.780 0.775 1.820 1.710 2.390 1.210 2.700

[897] 2.080 1.460 2.180 1.700 1.200 1.210 3.210 1.560 1.390 4.800 1.560 2.720 3.670 2.340 4.590 2.310

[913] 4.330 3.720 6.680 5.510 6.800 4.480 1.380 4.740 2.750 5.340 2.950 2.490 2.660 1.800 5.120 2.170

[929] 1.840 2.820 2.610 5.310 3.480 7.780 4.220 2.520 3.710 5.810 2.020 2.790 5.600 4.750 2.420 1.960

[945] 4.650 2.720 4.180 3.650 2.320 12.600 11.000 3.270 1.820 4.370 4.200 3.170 1.960 4.530 7.650 9.160

[961] 11.000 6.320 11.700 7.560 5.790 4.710 4.310 3.130 2.590 7.990 4.820 4.240 6.260 3.870 6.750 2.920

[977] 2.270 4.990 3.260 6.580 0.858 4.030 6.520 4.110 0.718 3.330 5.270 1.550 2.870 5.440 1.960 1.890

[993] 1.850 0.725 2.220 2.750 3.150 1.750 2.670 1.050

[ reached getOption("max.print") -- omitted 11155 entries ]

Part 5

> source('~/DS/calculator.R')

> calculator()

\*\*\*\*\*\*Simple R Calculator - Select operation: \*\*\*\*\*\*

1.Add

2.Subtract

3.Multiply

4.Divide

5.Factors

6.Prime

Enter choice [1/2/3/4/5/6] a

Are you kidding？Should be 1/2/3/4/5/6. Try again:

Enter choice [1/2/3/4/5/6] 7

Are you kidding？Should be 1/2/3/4/5/6. Try again:

Enter choice [1/2/3/4/5/6] 1

Enter first number: a

Are you kidding？Should be number. Try again:

Enter first number: 1

Enter second number: d

Are you kidding？Should be number. Try again:

Enter second number: 2

[1] "1 + 2 = 3"

Warning messages:

1: In calculator() : NAs introduced by coercion

2: In calculator() : NAs introduced by coercion

> calculator()

\*\*\*\*\*\*Simple R Calculator - Select operation: \*\*\*\*\*\*

1.Add

2.Subtract

3.Multiply

4.Divide

5.Factors

6.Prime

Enter choice [1/2/3/4/5/6] 2

Enter first number: a

Are you kidding？Should be number. Try again:

Enter first number: 3

Enter second number: a

Are you kidding？Should be number. Try again:

Enter second number: 1

[1] "3 - 1 = 2"

Warning messages:

1: In calculator() : NAs introduced by coercion

2: In calculator() : NAs introduced by coercion

> calculator()

\*\*\*\*\*\*Simple R Calculator - Select operation: \*\*\*\*\*\*

1.Add

2.Subtract

3.Multiply

4.Divide

5.Factors

6.Prime

Enter choice [1/2/3/4/5/6] 3

Enter first number: a

Are you kidding？Should be number. Try again:

Enter first number: 2

Enter second number: d

Are you kidding？Should be number. Try again:

Enter second number: 3

[1] "2 \* 3 = 6"

Warning messages:

1: In calculator() : NAs introduced by coercion

2: In calculator() : NAs introduced by coercion

> calculator()

\*\*\*\*\*\*Simple R Calculator - Select operation: \*\*\*\*\*\*

1.Add

2.Subtract

3.Multiply

4.Divide

5.Factors

6.Prime

Enter choice [1/2/3/4/5/6] 4

Enter first number: a

Are you kidding？Should be number. Try again:

Enter first number: 6

Enter second number: d

Are you kidding？Should be number. Try again:

Enter second number: 2

[1] "6 / 2 = 3"

Warning messages:

1: In calculator() : NAs introduced by coercion

2: In calculator() : NAs introduced by coercion

> calculator()

\*\*\*\*\*\*Simple R Calculator - Select operation: \*\*\*\*\*\*

1.Add

2.Subtract

3.Multiply

4.Divide

5.Factors

6.Prime

Enter choice [1/2/3/4/5/6] 4

Enter first number: 6

Enter second number: 0

[1] "Invalid value，divident should not Zero!"

> calculator()

\*\*\*\*\*\*Simple R Calculator - Select operation: \*\*\*\*\*\*

1.Add

2.Subtract

3.Multiply

4.Divide

5.Factors

6.Prime

Enter choice [1/2/3/4/5/6] 5

Enter the number: 120

[1] "The factors of 120 are:"

[1] 1

[1] 2

[1] 3

[1] 4

[1] 5

[1] 6

[1] 8

[1] 10

[1] 12

[1] 15

[1] 20

[1] 24

[1] 30

[1] 40

[1] 60

[1] 120

> calculator()

\*\*\*\*\*\*Simple R Calculator - Select operation: \*\*\*\*\*\*

1.Add

2.Subtract

3.Multiply

4.Divide

5.Factors

6.Prime

Enter choice [1/2/3/4/5/6] 6

Enter the number: a

Are you kidding？Should be number. Try again:

Enter the number: 30

[1] "The number of 30 is: NOT Prime"

Warning message:

In calculator() : NAs introduced by coercion

> calculator()

\*\*\*\*\*\*Simple R Calculator - Select operation: \*\*\*\*\*\*

1.Add

2.Subtract

3.Multiply

4.Divide

5.Factors

6.Prime

Enter choice [1/2/3/4/5/6] 6

Enter the number: 13

[1] "The number of 13 is: Prime"