Department of Statistics

COURSE STATS 330/762

Assignment 1, 2012

Instructions: Hand in your completed assignment to the Student Resource Centre by **4pm August 2nd**

The data sets for this assignment are in the files **banknotes.txt** (for Question 1) and **plot.csv** (for Question 2) which are available on the course web page.

Question 1.

The data in the file **`banknotes.txt`** are measurements on 200 Swiss banknotes, of which 100 are genuine and the rest forgeries. The variables in the data set are

Length :	Length of bill, mm
Left :	Width of left edge, mm
Right :	Width of right edge, mm
Bottom:	Bottom margin width, mm
Top:	Top margin width, mm
Diagonal :	Length of image diagonal, mm
Y:	0 = genuine, 1 = counterfeit

Instructions

1. Load the data into R, and make a data frame **banknotes.df** to contain the data. Check for any typographical errors (the data below may be taken to be the correct data, but the data on the web may have been corrupted). Print out the last 10 lines of the data file. (Note that the data set has row labels: these are not part of the data. You can read data like this by omitting the "header=TRUE" argument to read.table.) [5 marks]

2. Using a suitable plot or plots, devise a graphical method that will allow you to discriminate between genuine and counterfeit banknotes on the basis of these measurements. Describe the method in everyday language. [10 marks]

3. Suppose a banknote has Diagonal = 139.5mm; Right = 130.0mm; Top=11.0mm. Is it genuine or a fake? Why? [5 marks]

In answering these questions, do not fit any models or use any non-graphical techniques. Graphs alone will suffice. To win the marks there must be some explanation, not just pictures.

Question 2

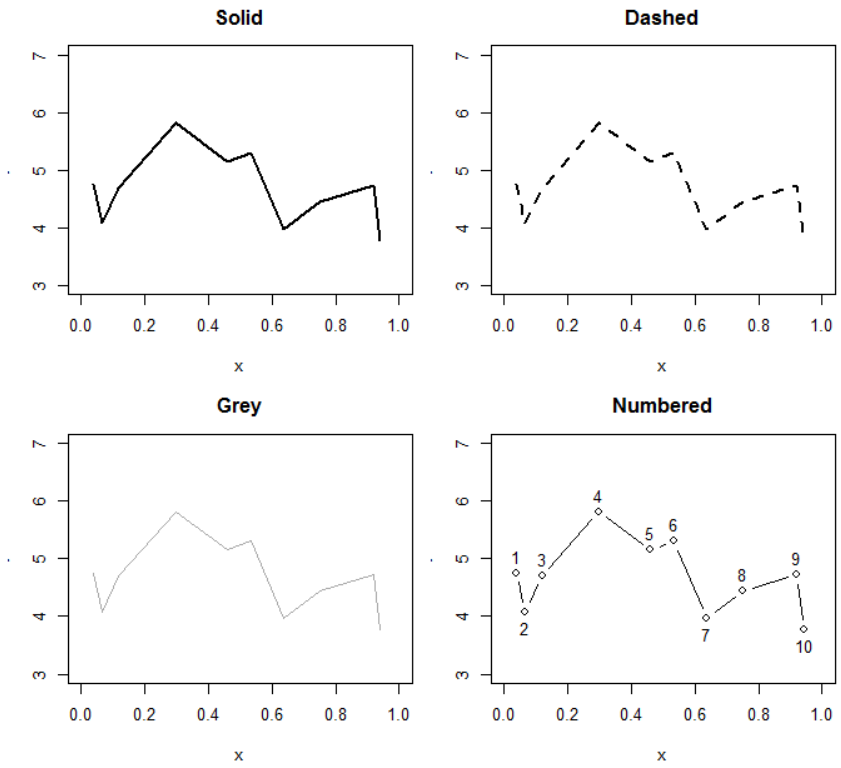
The data for this question are in the file **`plot.csv`** which you can download from the course web page.

Instructions

1. Load the data into R and print it out to three decimal places [3 marks]

2. Draw four plots (on the same page) of the data that resemble as much as possible the figure below. Pay careful attention to the labeling of the points and the axes. [12 marks]

3. The x-values in the file are in ascending order. If this had not been the case what code would be necessary to allow for this? [3 marks]



Total for assignment: 40 marks

R hints

1. Use **read.table** to create the data frames.
2. Use regular R graphics to help answer Question 1.
3. Experiment with the col argument to the functions **points** and **pairs.**
4. The R function **round** may be useful.
5. To set axes on plots, use the xlim and ylim arguments to **plot.**
6. You can get the row labels from a data frame using the function **row.names.**

Data sets

Banknotes.txt

	Length	Left	Right	Bottom	Top	Diagonal	Y
1	214.8	131.0	131.1	9.0	9.7	141.0	0
2	214.6	129.7	129.7	8.1	9.5	141.7	0
3	214.8	129.7	129.7	8.7	9.6	142.2	0
4	214.8	129.7	129.6	7.5	10.4	142.0	0
5	215.0	129.6	129.7	10.4	7.7	141.8	0
6	215.7	130.8	130.5	9.0	10.1	141.4	0
7	215.5	129.5	129.7	7.9	9.6	141.6	0
8	214.5	129.6	129.2	7.2	10.7	141.7	0
9	214.9	129.4	129.7	8.2	11.0	141.9	0
10	215.2	130.4	130.3	9.2	10.0	140.7	0
11	215.3	130.4	130.3	7.9	11.7	141.8	0
12	215.1	129.5	129.6	7.7	10.5	142.2	0
13	215.2	130.8	129.6	7.9	10.8	141.4	0
14	214.7	129.7	129.7	7.7	10.9	141.7	0
15	215.1	129.9	129.7	7.7	10.8	141.8	0
16	214.5	129.8	129.8	9.3	8.5	141.6	0
17	214.6	129.9	130.1	8.2	9.8	141.7	0
18	215.0	129.9	129.7	9.0	9.0	141.9	0
19	215.2	129.6	129.6	7.4	11.5	141.5	0
20	214.7	130.2	129.9	8.6	10.0	141.9	0
21	215.0	129.9	129.3	8.4	10.0	141.4	0
22	215.6	130.5	130.0	8.1	10.3	141.6	0
23	215.3	130.6	130.0	8.4	10.8	141.5	0
24	215.7	130.2	130.0	8.7	10.0	141.6	0
25	215.1	129.7	129.9	7.4	10.8	141.1	0
26	215.3	130.4	130.4	8.0	11.0	142.3	0
27	215.5	130.2	130.1	8.9	9.8	142.4	0

28	215.1	130.3	130.3	9.8	9.5	141.9	0
29	215.1	130.0	130.0	7.4	10.5	141.8	0
30	214.8	129.7	129.3	8.3	9.0	142.0	0
31	215.2	130.1	129.8	7.9	10.7	141.8	0
32	214.8	129.7	129.7	8.6	9.1	142.3	0
33	215.0	130.0	129.6	7.7	10.5	140.7	0
34	215.6	130.4	130.1	8.4	10.3	141.0	0
35	215.9	130.4	130.0	8.9	10.6	141.4	0
36	214.6	130.2	130.2	9.4	9.7	141.8	0
37	215.5	130.3	130.0	8.4	9.7	141.8	0
38	215.3	129.9	129.4	7.9	10.0	142.0	0
39	215.3	130.3	130.1	8.5	9.3	142.1	0
40	213.9	130.3	129.0	8.1	9.7	141.3	0
41	214.4	129.8	129.2	8.9	9.4	142.3	0
42	214.8	130.1	129.6	8.8	9.9	140.9	0
43	214.9	129.6	129.4	9.3	9.0	141.7	0
44	214.9	130.4	129.7	9.0	9.8	140.9	0
45	214.8	129.4	129.1	8.2	10.2	141.0	0
46	214.3	129.5	129.4	8.3	10.2	141.8	0
47	214.8	129.9	129.7	8.3	10.2	141.5	0
48	214.8	129.9	129.7	7.3	10.9	142.0	0
49	214.6	129.7	129.8	7.9	10.3	141.1	0
50	214.5	129.0	129.6	7.8	9.8	142.0	0
51	214.6	129.8	129.4	7.2	10.0	141.3	0
52	215.3	130.6	130.0	9.5	9.7	141.1	0
53	214.5	130.1	130.0	7.8	10.9	140.9	0
54	215.4	130.2	130.2	7.6	10.9	141.6	0
55	214.5	129.4	129.5	7.9	10.0	141.4	0
56	215.2	129.7	129.4	9.2	9.4	142.0	0
57	215.7	130.0	129.4	9.2	10.4	141.2	0
58	215.0	129.6	129.4	8.8	9.0	141.1	0
59	215.1	130.1	129.9	7.9	11.0	141.3	0
60	215.1	130.0	129.8	8.2	10.3	141.4	0
61	215.1	129.6	129.3	8.3	9.9	141.6	0
62	215.3	129.7	129.4	7.5	10.5	141.5	0
63	215.4	129.8	129.4	8.0	10.6	141.5	0
64	214.5	130.0	129.5	8.0	10.8	141.4	0
65	215.0	130.0	129.8	8.6	10.6	141.5	0
66	215.2	130.6	130.0	8.8	10.6	140.8	0
67	214.6	129.5	129.2	7.7	10.3	141.3	0
68	214.8	129.7	129.3	9.1	9.5	141.5	0
69	215.1	129.6	129.8	8.6	9.8	141.8	0
70	214.9	130.2	130.2	8.0	11.2	139.6	0
71	213.8	129.8	129.5	8.4	11.1	140.9	0
72	215.2	129.9	129.5	8.2	10.3	141.4	0
73	215.0	129.6	130.2	8.7	10.0	141.2	0
74	214.4	129.9	129.6	7.5	10.5	141.8	0

75	215.2	129.9	129.7	7.2	10.6	142.1	0
76	214.1	129.6	129.3	7.6	10.7	141.7	0
77	214.9	129.9	130.1	8.8	10.0	141.2	0
78	214.6	129.8	129.4	7.4	10.6	141.0	0
79	215.2	130.5	129.8	7.9	10.9	140.9	0
80	214.6	129.9	129.4	7.9	10.0	141.8	0
81	215.1	129.7	129.7	8.6	10.3	140.6	0
82	214.9	129.8	129.6	7.5	10.3	141.0	0
83	215.2	129.7	129.1	9.0	9.7	141.9	0
84	215.2	130.1	129.9	7.9	10.8	141.3	0
85	215.4	130.7	130.2	9.0	11.1	141.2	0
86	215.1	129.9	129.6	8.9	10.2	141.5	0
87	215.2	129.9	129.7	8.7	9.5	141.6	0
88	215.0	129.6	129.2	8.4	10.2	142.1	0
89	214.9	130.3	129.9	7.4	11.2	141.5	0
90	215.0	129.9	129.7	8.0	10.5	142.0	0
91	214.7	129.7	129.3	8.6	9.6	141.6	0
92	215.4	130.0	129.9	8.5	9.7	141.4	0
93	214.9	129.4	129.5	8.2	9.9	141.5	0
94	214.5	129.5	129.3	7.4	10.7	141.5	0
95	214.7	129.6	129.5	8.3	10.0	142.0	0
96	215.6	129.9	129.9	9.0	9.5	141.7	0
97	215.0	130.4	130.3	9.1	10.2	141.1	0
98	214.4	129.7	129.5	8.0	10.3	141.2	0
99	215.1	130.0	129.8	9.1	10.2	141.5	0
100	214.7	130.0	129.4	7.8	10.0	141.2	0
101	214.4	130.1	130.3	9.7	11.7	139.8	1
102	214.9	130.5	130.2	11.0	11.5	139.5	1
103	214.9	130.3	130.1	8.7	11.7	140.2	1
104	215.0	130.4	130.6	9.9	10.9	140.3	1
105	214.7	130.2	130.3	11.8	10.9	139.7	1
106	215.0	130.2	130.2	10.6	10.7	139.9	1
107	215.3	130.3	130.1	9.3	12.1	140.2	1
108	214.8	130.1	130.4	9.8	11.5	139.9	1
109	215.0	130.2	129.9	10.0	11.9	139.4	1
110	215.2	130.6	130.8	10.4	11.2	140.3	1
111	215.2	130.4	130.3	8.0	11.5	139.2	1
112	215.1	130.5	130.3	10.6	11.5	140.1	1
113	215.4	130.7	131.1	9.7	11.8	140.6	1
114	214.9	130.4	129.9	11.4	11.0	139.9	1
115	215.1	130.3	130.0	10.6	10.8	139.7	1
116	215.5	130.4	130.0	8.2	11.2	139.2	1
117	214.7	130.6	130.1	11.8	10.5	139.8	1
118	214.7	130.4	130.1	12.1	10.4	139.9	1
119	214.8	130.5	130.2	11.0	11.0	140.0	1
120	214.4	130.2	129.9	10.1	12.0	139.2	1
121	214.8	130.3	130.4	10.1	12.1	139.6	1

122	215.1	130.6	130.3	12.3	10.2	139.6	1
123	215.3	130.8	131.1	11.6	10.6	140.2	1
124	215.1	130.7	130.4	10.5	11.2	139.7	1
125	214.7	130.5	130.5	9.9	10.3	140.1	1
126	214.9	130.0	130.3	10.2	11.4	139.6	1
127	215.0	130.4	130.4	9.4	11.6	140.2	1
128	215.5	130.7	130.3	10.2	11.8	140.0	1
129	215.1	130.2	130.2	10.1	11.3	140.3	1
130	214.5	130.2	130.6	9.8	12.1	139.9	1
131	214.3	130.2	130.0	10.7	10.5	139.8	1
132	214.5	130.2	129.8	12.3	11.2	139.2	1
133	214.9	130.5	130.2	10.6	11.5	139.9	1
134	214.6	130.2	130.4	10.5	11.8	139.7	1
135	214.2	130.0	130.2	11.0	11.2	139.5	1
136	214.8	130.1	130.1	11.9	11.1	139.5	1
137	214.6	129.8	130.2	10.7	11.1	139.4	1
138	214.9	130.7	130.3	9.3	11.2	138.3	1
139	214.6	130.4	130.4	11.3	10.8	139.8	1
140	214.5	130.5	130.2	11.8	10.2	139.6	1
141	214.8	130.2	130.3	10.0	11.9	139.3	1
142	214.7	130.0	129.4	10.2	11.0	139.2	1
143	214.6	130.2	130.4	11.2	10.7	139.9	1
144	215.0	130.5	130.4	10.6	11.1	139.9	1
145	214.5	129.8	129.8	11.4	10.0	139.3	1
146	214.9	130.6	130.4	11.9	10.5	139.8	1
147	215.0	130.5	130.4	11.4	10.7	139.9	1
148	215.3	130.6	130.3	9.3	11.3	138.1	1
149	214.7	130.2	130.1	10.7	11.0	139.4	1
150	214.9	129.9	130.0	9.9	12.3	139.4	1
151	214.9	130.3	129.9	11.9	10.6	139.8	1
152	214.6	129.9	129.7	11.9	10.1	139.0	1
153	214.6	129.7	129.3	10.4	11.0	139.3	1
154	214.5	130.1	130.1	12.1	10.3	139.4	1
155	214.5	130.3	130.0	11.0	11.5	139.5	1
156	215.1	130.0	130.3	11.6	10.5	139.7	1
157	214.2	129.7	129.6	10.3	11.4	139.5	1
158	214.4	130.1	130.0	11.3	10.7	139.2	1
159	214.8	130.4	130.6	12.5	10.0	139.3	1
160	214.6	130.6	130.1	8.1	12.1	137.9	1
161	215.6	130.1	129.7	7.4	12.2	138.4	1
162	214.9	130.5	130.1	9.9	10.2	138.1	1
163	214.6	130.1	130.0	11.5	10.6	139.5	1
164	214.7	130.1	130.2	11.6	10.9	139.1	1
165	214.3	130.3	130.0	11.4	10.5	139.8	1
166	215.1	130.3	130.6	10.3	12.0	139.7	1
167	216.3	130.7	130.4	10.0	10.1	138.8	1
168	215.6	130.4	130.1	9.6	11.2	138.6	1

169	214.8	129.9	129.8	9.6	12.0	139.6	1
170	214.9	130.0	129.9	11.4	10.9	139.7	1
171	213.9	130.7	130.5	8.7	11.5	137.8	1
172	214.2	130.6	130.4	12.0	10.2	139.6	1
173	214.8	130.5	130.3	11.8	10.5	139.4	1
174	214.8	129.6	130.0	10.4	11.6	139.2	1
175	214.8	130.1	130.0	11.4	10.5	139.6	1
176	214.9	130.4	130.2	11.9	10.7	139.0	1
177	214.3	130.1	130.1	11.6	10.5	139.7	1
178	214.5	130.4	130.0	9.9	12.0	139.6	1
179	214.8	130.5	130.3	10.2	12.1	139.1	1
180	214.5	130.2	130.4	8.2	11.8	137.8	1
181	215.0	130.4	130.1	11.4	10.7	139.1	1
182	214.8	130.6	130.6	8.0	11.4	138.7	1
183	215.0	130.5	130.1	11.0	11.4	139.3	1
184	214.6	130.5	130.4	10.1	11.4	139.3	1
185	214.7	130.2	130.1	10.7	11.1	139.5	1
186	214.7	130.4	130.0	11.5	10.7	139.4	1
187	214.5	130.4	130.0	8.0	12.2	138.5	1
188	214.8	130.0	129.7	11.4	10.6	139.2	1
189	214.8	129.9	130.2	9.6	11.9	139.4	1
190	214.6	130.3	130.2	12.7	9.1	139.2	1
191	215.1	130.2	129.8	10.2	12.0	139.4	1
192	215.4	130.5	130.6	8.8	11.0	138.6	1
193	214.7	130.3	130.2	10.8	11.1	139.2	1
194	215.0	130.5	130.3	9.6	11.0	138.5	1
195	214.9	130.3	130.5	11.6	10.6	139.8	1
196	215.0	130.4	130.3	9.9	12.1	139.6	1
197	215.1	130.3	129.9	10.3	11.5	139.7	1
198	214.8	130.3	130.4	10.6	11.1	140.0	1
199	214.7	130.7	130.8	11.2	11.2	139.4	1
200	214.3	129.9	129.9	10.2	11.5	139.6	1

Plot.csv

x	y
0.03736371	4.756727
0.06666740	4.082145
0.11869260	4.700702
0.29618763	5.820618
0.45986273	5.152557
0.53481258	5.303594
0.63719090	3.971056
0.75161621	4.442972
0.91996628	4.726346
0.94153297	3.778662