

Topic 7f: Box and Whisker Plots

Here are a number of tables of data. Box and whisker plot for each table

Table 1

gnrnd4(1497539102, 78301453)

156.8	147.1	149.2	149.1	192.9	158.7	171.0	145.5	180.6	172.8	220.8	150.9
145.5	195.7	164.6	219.8	164.3	152.0	205.5	215.8	211.2	211.8	145.4	174.5
148.8	145.8	167.8	172.8	147.7	149.7	204.3	150.6	151.0	151.5	162.0	151.6
167.6	193.6	169.1	163.1	150.0	145.6	153.3	164.6	197.0	175.5	158.3	200.1
146.6	158.3	147.3	145.8	204.5	196.2	154.0	147.5	175.9	169.2	150.0	146.4
146.2	220.3	146.0	172.9	158.1	189.1	151.7	205.8	166.7	186.7	148.7	145.9
205.5	181.8	206.9	157.7	148.1	220.0	146.2	154.3	160.8	192.1	206.0	145.4
197.6	152.1	183.1	215.0	159.8	170.6	147.9	174.9				

Notice how the data is bunched up at the left and how it trails off to the right.
Because the "long tail" is on the right this is characterized as **skewed to the right**.

Table 2

gnrnd4(723859503, 7800145)

199	187	221	213	201	207	204	195	178	207	213	195	220	214	222
193	152	212	212	178	215	222	210	196	172	188	211	204	220	222
209	213	191	215	220	188	204	194	194	166	192	212	204	189	220
188	196	169	162	218	199	156	210	176	222	220	203	213	204	201
193	206	208	170	205	212	214	214	184	221	195	191	186	174	206
207	212	177	210	221	150	205	207	176	207	202	205	190	214	168
200	180	188	214	191	194									

Notice how the data is bunched up on the right and how it trails off to the left.
Because the "long tail" is on the left this is characterized as **skewed to the left**.

Table 3

gnrnd4(1849829701, 79001403)

191.4	152.4	164.0	205.1	190.6	147.9	213.4	163.4	167.9	166.3	208.1	164.1
194.6	182.6	203.3	178.3	192.5	174.2	187.2	218.7	163.7	192.4	199.1	155.1
184.2	216.9	160.7	175.9	140.8	187.9	202.5	164.3	193.7	178.2	199.3	163.5
155.6	174.2	198.0	154.6	186.2	143.8	198.8	164.2	215.7	145.4	215.4	160.6
195.7	202.4	146.6	158.8	159.2	203.9	212.3	193.5	145.4	205.0	165.9	219.2
201.7	178.2	152.0	184.8	215.4	206.9	159.2	164.5	211.0	187.9	188.0	189.8
140.8	184.0	160.6	172.2	201.0	211.6	201.9	148.7	162.2	186.2	198.7	177.7
179.7	166.8	198.2	156.1	183.4	202.5	146.5	197.3	141.5	194.2	142.1	176.9
209.1	211.1										

Notice how the data is spread pretty evenly across the range of values. The median is right in the middle and the first and third quartile split the range into about 4 equal width pieces. A histogram does give a better feeling that this is a **uniform distribution**.

Table 4 **gnrnd4(1849829704, 18001800)**

165.6	181.9	182.4	179.6	198.7	182.6	193.8	183.3	190.2	164.1	189.6	180.7	174.7
155.0	198.0	171.8	182.4	172.1	185.3	203.1	176.5	210.8	177.8	192.0	155.4	200.7
167.9	190.6	182.4	181.2	155.4	168.0	216.7	209.1	182.0	152.8	162.9	212.3	175.6
182.2	168.0	193.6	174.1	207.6	169.3	194.3	156.8	156.7	175.9	205.9	191.3	196.9
195.0	188.4	193.1	188.1	158.3	156.8	166.4	216.7	203.3	177.4	140.6	172.5	206.3
192.2	218.8	180.8	201.7	160.8	179.8	174.1	219.0	178.0	187.5	171.0	145.8	187.9
186.4	176.6	194.7	185.1	179.3	195.8	171.2	178.8	189.7	172.6	178.4	161.5	218.2
174.9	201.3	168.3	164.4	162.3	169.0	184.4						

Even the initial graph suggests a **normal** distribution. The plot is symmetric about the median. The median is in about the middle of both the graph and the rectangle. The width of the two tails is about the same and that width is somewhere over 3 and less than 4 times the width of the smaller boxes. The final graph, with the special values plotted in red, is even more convincing that this is a **normal** distribution.

Table 5 **gnrnd5(143879025405, 124001500, 134002100)**

214.9	216.5	212.8	212.1	204.4	154.3	168.2	222.5	213.5	222.7	212.9	212.9	118.9	214.8	162.6
155.5	147.6	194.8	219.9	152.9	164.8	201.1	136.2	240.8	159.6	143.9	219.8	211.6	213.0	138.0
181.8	153.3	130.0	163.3	196.3	216.4	159.3	144.6	209.4	203.6	125.6	214.5	144.3	215.8	212.0
209.6	151.3	148.5	219.7	218.4	173.7	144.2	211.4	164.6	177.3	184.1	218.4	197.1	233.1	143.8
203.0	218.0	190.4	149.1	216.6	153.8	200.5	153.4	208.1	215.7	142.9	128.8	165.5	157.8	154.7
140.3	210.2	205.1	154.6	212.9	215.8	143.0	226.3	213.0	229.1	134.3	232.5	209.5	209.8	193.5
152.4	187.6	143.7	219.5	198.6	141.5	210.2	213.1	136.8	143.3	160.6	145.2	160.5	150.4	217.0
133.4	219.6	212.7	144.9	220.0	153.2	151.0	195.9	174.1	133.3	153.8	178.6	143.7	194.5	154.1
165.2	193.8	225.1	205.6	203.8	216.8	232.5	202.8	145.4	142.2	208.0	141.3	213.7	226.3	180.5
240.4	206.1	155.7	204.4	165.7	155.7	166.6	156.3	213.1	217.5	217.9	234.0	218.8	140.7	160.1
119.8	153.8	224.3	206.0	147.1	214.4	150.0	161.2	170.8	218.3	146.0	164.2	191.2	230.5	188.3
199.5	158.3	152.1	218.4	133.6	137.1	226.3	210.6	138.7	164.9	189.3	151.1	229.1	185.8	147.8
150.9	130.0	216.8	195.8	150.2	166.6	193.4	130.8	200.4	156.6	206.3	203.2	234.8	156.4	190.1
138.8	113.5	210.2	193.3	218.3	146.0	231.0	159.6	204.5	157.2	162.4	158.6	157.4	149.7	203.8
138.3	221.9	153.7	144.4	146.1	191.4	152.1	243.9	242.0	203.9	148.2	230.5	207.6	136.9	219.1
235.5	137.4	144.9	152.0	131.4	201.7	203.2	133.7	218.5	125.4	223.2	147.9	165.1	174.7	159.3
142.0	138.5	141.9	201.9	211.9	200.9	148.3	195.4	162.1	207.6	230.6	199.6	149.0	189.0	130.4

We know that this data is an example of a **bimodal** distribution from the histogram that we made for this table. However, the box and whisker plot does not reveal that distribution at all. In fact, comparing the box plot here to those we saw earlier we would be tempted to say that this is a **uniform** distribution. Thus, we will note that the box plot does not do a good job of differentiating between **bimodal** and **uniform** distributions.