Sample Solution for Problem 2.37

State: How does increasing compression affect soil penetrability?

Formulate: We need to compare the distributions by examining graphical and numerical summaries of the data, including appropriate measures of center and spread.

Solve: Side-by-side stemplots and summary statistics are provided below. (Note thate the slight skew evident in the Intermediate stemplot makes the five-number summary preferable to simply reporting the mean and standard deviation).

Compressed		Intermediate		Loose	
26	8	26		26	
27	6 8 8 8	27		27	
28	1 2 2 6 6	28		28	
29	0 2 4 6 8	29	2 6	29	
30	0 8 8	30	2	30	
31	6 8	31	0 2 4 4 8 8	31	
32		32	6	32	
33		33	6 8 8	33	
34		34	0 4 6	34	
35		35	4	35	
36		36	2	36	
37		37		37	
38		38	6	38	
39		39		39	4 6 8 9
40		40		40	0 3
41		41		41	1 2 3 6 9
42		42	6	42	0 7 9
43		43		43	0 4
44		44		44	1
45		45		45	
46		46		46	
47		47		47	
48		48		48	9
49		49		49	1

Summary Statistics

Statistic	*Compressed*	*Intermediate*	*Loose*
n	20	20	20
Min	2.68	2.92	3.94
Q_1	2.795	3.13	4.015
M	2.88	3.31	4.175
Q_3	2.99	3.45	4.32
Max	3.18	4.26	4.91
$\overline{x}$	2.91	3.34	4.23
s	0.139	0.319	0.271
IQR	0.195	0.32	0.305

Conclude: Both the graphs and the numerical summaries suggest that soil penetrability is greatest for loose soil and least for compressed soil. The median soil penetrability for Intermediate soil (3.31) is about 15 percent greater than for Compressed soil (2.88); in the extreme, the median soil penetrability of Loose soil (4.175) is about 45 percent greater than for the Compressed soil.