Stat 160 Fall 2008
Solutions to Assignment #3

#3.26 It is easiest to draw a stem-and-leaf plot if we multiple our data by 100 and then round to the nearest 10. Thus, our transformed data for soil with intermediate compression is

292	314	336	346
296	314	338	354
302	318	338	362
310	318	340	386
312	326	344	426

which, when rounded to the nearest 10, gives

290	310	340	350
300	310	340	350
300	320	340	360
310	320	340	390
310	330	340	430

and so if we now drop the trailing 0, then we can draw our stem-and-leaf plot (with split stems) as follows.

2	9
3	0 0 1 1 1 1 2 2 3 4 4 4 4 4
3	5 5 6 9
4	3

As for the soil with loose compression, our data when multiplied by 100 is

394	403	419	434
396	411	420	441
398	412	427	441
399	413	429	489
400	416	430	491

and when rounded to the nearest 10, we have

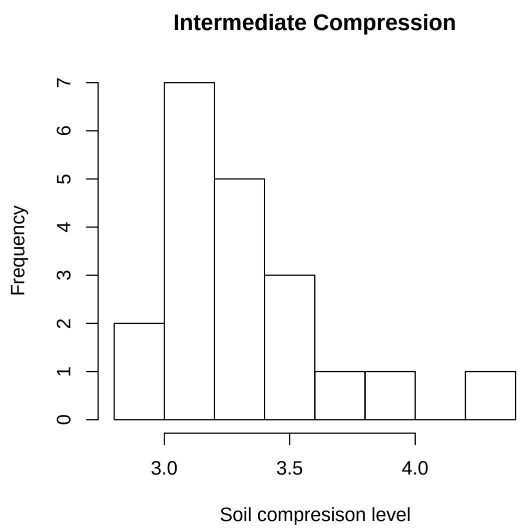
390	400	420	430
400	410	420	440
400	410	430	440
400	410	430	490
400	420	430	490

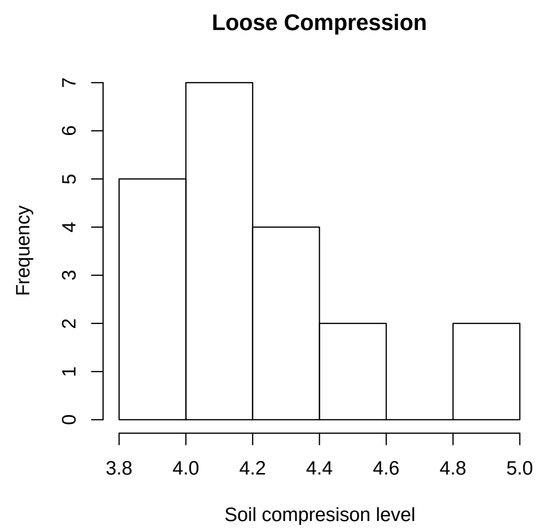
so that the resulting stem-and-leaf plot (with split stems) is

3	9
4	0 0 0 0 0 1 1 1 2 2 2 3 3 3 3 4 4
4	9 9

We can now see that, in both cases, our data is slightly skewed to the right. For the soil with intermediate compression, this is more pronounced. If this data were truly normal, then we should see a perfectly symmetric stem-and-leaf plot. Nonetheless, it is clear that neither appear distinctly non-normal, and so it is probably reasonable to model both soil compressions as being from a normal distribution.

One comment is worth making. If, instead of stem-and-leaf plots, we drew histograms with class definitions open on the left and closed on the right, then the resulting histograms would clearly demonstrate a skew to the right.





#3.46 (a) Let x denote a male applicant's math SAT score. We are interested in calculating the probability that x is greater than 750; that is, the probability that $x > 750$. Since x follows a $N(537, 116)$ distribution, we find that standardizing x gives

$$x > 750$$
$$\frac{x - 537}{116} > \frac{750 - 537}{116}$$
$$z > 1.84.$$

From Table A, we find that the corresponding probability is $1 - 0.9671 = 0.0329$. In other words, roughly 3.29% of men scored 750 or better.

#3.46 (b) Let x denote a female applicant's math SAT score. We are again interested in calculating the probability that x is greater than 750; that is, the probability that $x > 750$. Since x now follows a $N(501, 110)$ distribution, we find that standardizing x gives

$$x > 750$$
$$\frac{x - 501}{110} > \frac{750 - 501}{110}$$
$$z > 2.26.$$

From Table A, we find that the corresponding probability is $1 - 0.9881 = 0.0119$. In other words, roughly 1.19% of women scored 750 or better.

As noted in the text, we see that the percent of men with SAT math scores above 750 is nearly three times the percent of women with SAT math scores above 750.

#3.48 (a) By definition, the World Health Organization says that a person has osteoporosis if his or her BMD is 2.5 standard deviations below the mean. Assuming that BMD scores follow a normal distribution, we can consult Table 2.5 to see that the probability of a standardized score being below -2.5 is 0.0062. In other words, about 0.6% of healthy young adults have osteoporosis.

#3.48 (b) Assuming that the standard deviation is the same for young adults as it is for older women, and since the mean BMD in this age is -2 on the standard scale for young adults, we see that an older woman has osteoporosis if her standardized score is below -0.5. Consulting Table A, we conclude that the probability of a standardized score being below -0.5 is 0.3085. In other words, about 31% of older women have osteoporosis.

#4.31 Explanations and sketches will vary, but should note that correlation measures the strength of the association, not the slope of the line. The hypothetical Funds A and B mentioned in the report, for example, might be related by a linear formula with slope 2 (or 1/2).

#4.32 (a) Rachel should choose small-cap stocks since small-cap stocks have a lower correlation with municipal bonds. In other words, a lower correlation between municipal bonds and small-cap stocks means that the relationship between municipal bonds and small-cap stocks is weaker than the relationship between municipal bonds and large-cap stocks.

#4.32 (b) Rachel should look for a negative correlation (although this would also mean that this investment tends to decrease when bond prices rise).

#4.34 Professor McDaniel's findings mean there is little linear association between research and teaching. For example, knowing that a professor is a good researcher gives little information about whether she is a good or bad teacher. (The person who wrote the article interpreted a correlation close to 0 as if it were a correlation close to -1 implying a negative association between teaching ability and research productivity.)