BIOL 300 Assignment 7, Spring 2012 (not turned in)

Chapter 10

15. **(a)** Mean = 100.
    (b) Mode = 100 (in a normal curve, the most common value is the mean).
    (c) Median = 100 (since the normal curve is symmetric, the middle value is the mean).
    (d) $s = 5$ (since 1/3 of the data lies outside of 95 to 105, and roughly 2/3 of the data lies within one standard deviation of the mean).
    (e) Variance = $s^2 = 25$.

16. **(a)** Convert to standard normal deviate: (0.65 - 0.569) / 0.068 = 1.19. Pr[1.19 < Z] = 0.11702, so 11.7%% of states (roughly 6) should have 65% or more of fatalities due to drunk drivers.
    (b) The 25th percentile will be below the mean: we need the percentage that will correspond to a Z score yielding P = 0.25. We find that Z = 0.67 corresponds to P = 0.25143. As this is below the mean, Z will be negative. Thus the 25th percentile occurs about 0.67 standard deviations below the mean, or (0.67)(6.8%)= 4.6% fatalities. We expect the 25th percentile state to have approximately (56.9-4.6) = 52.3% of fatalities due to drunk driving.

17.

Mean	SD	y	Z	Pr[Y > y]	Pr[Y < y]
14	5	9	-1	1- 0.15866=-.84134	0.15866
15	3	18.5	1.17	0.12100	1-0.12100 = 0.87900
-23	4	-16	1.75	0.04006	1-0.04006 = 0.95994
14000	5000	9000	-1	1- 0.15866=-.84134	0.15866

20.

Mean	s	y	SE $_{20}$	Z_{20}	$Pr(\overline{Y} < Y)$	SE_{50}	Z_{50}	$Pr(\overline{Y} < Y)$
-5	5	-5.2	1.118	-0.18	0.43	0.707	-0.28	0.39
10	30	8.0	6.708	-0.30	0.38	4.243	-0.47	0.32
-55	20	-61.0	4.472	-1.34	0.08	2.828	-2.12	0.02
12	3	12.5	0.671	0.67	0.78	0.424	1.18	0.88

Chapter 11

12. **(a)** The researchers had separate samples, so the standard deviations might have differed between them by chance. Also, the researchers might have had different sample sizes, so even if the standard deviation had been the same the standard error would differ.

(b) The researcher with the smaller confidence interval probably had the larger sample size, as both the SE and the critical t value decrease as the sample size increases.

(c) We cannot know that the difference was due to the sample size. By chance, the larger sample may have had a much higher sample standard deviation, causing it to have a broader confidence interval.

13. **(a)** On average, 88.2% of the time southern hemisphere dolphins swim clockwise.
(b) The standard error is 2.86%, the $df = 7$, critical $t_{0.05(2),7\ df} = 2.36$, so the confidence interval is $88.2 \pm 2.86(2.36)$ or $81.4 < \mu < 95.0\%$.
(c) For the 99% confidence interval, we use the same calculation, but with $t_{0.01(2),7\ df} = 3.5$, so the interval is: $78.2\% < \mu < 98.2\%$.
(d) The standard deviation of clockwise swimming is 8.1%.
(e) The median value for the percentage of clockwise swimming is the average of the 4th and 5th values, or 87.1%.
(f) To test the null that $\mu_0 = 0.5$, we calculate $t = (88.2 - 50) / 2.86 = 13.4$. For 7 *df*, 13.4 > 7.06, the critical value for $P = 0.0002$. We reject the null hypothesis, $P < 0.0002$.

17. **(a)** Mean relatedness = -0.05, $s = 0.45$, SE = 0.20. The critical value for $t_{0.05(2),4\ df} = 2.78$, so the 95% confidence interval is $-0.05 \pm 0.2\ (2.78)$, or $-0.61 < \mu < 0.51$.
(b) We calculate t: $t = (-0.05 - 0) / 0.2 = -0.25$. This is closer to zero than t_{crit} for $\alpha(2) = 0.05$ for 4 *df*, so we do not reject the hypothesis that the unhelpful subordinates have a relatedness of zero.