Stat 3011 Final Exam (Class Part)

Problem 1

This is like question 3 on the first midterm

$$\begin{aligned}
\text{pr(no defects in 24 widgets)} &= \text{pr(no defect in 1 widget)}^{24} \\
&= [1 - \text{pr(defect in 1 widget)}]^{24} \\
&= (1 - 0.01)^{24} \\
&= 0.7856781
\end{aligned}$$

Problem 2

This is like additional homework problem 9.

(a) For a difference involving questions on two *different* polls, multiply the margins of error by 1.5 (Wild and Seber, p. 350) giving 6% for the margin of error.

(b) For a difference involving questions answered by the *same* people on the *same* poll, multiply the margins of error by 2 (Wild and Seber, p. 350) giving 8% for the margin of error.

Problem 3

(a) The confidence interval is

$$\bar{x} \pm (\text{critical value}) \frac{s}{\sqrt{n}}$$

In this problem

$$\begin{aligned}
\bar{x} &= 10.7 \\
s &= 2.4 \\
n &= 10
\end{aligned}$$

The only issue is what to use for the critical value. Since n is small, we must use a t critical value from the table of t critical values, Appendix A6 in Wild and Seber.

The degrees of freedom are $n - 1 = 9$. The critical value for 95% confidence is in the label headed .025 and having the z critical value 1.96 at the bottom. The critical value for 9 degrees of freedom is 2.262. This gives

$$10.7 \pm 1.716737$$

for the interval The standard errors should be rounded to two significant figures (Section 7.4.3 in Wild and Seber) giving 1.7 for the plus or minus.

The interval form is $(8.983263, 12.416737)$. The same section of Wild and Seber recommends rounding intervals so that the last digit of the interval is about one more digit than the width of the interval, here $(9.0, 12.4)$.

(b) Use of Student's t distribution always involves an assumption that the population distribution is *normal*, exactly normal if the interval is to be exactly correct, approximately normal for the interval to be approximately correct.

(c) Only the t critical value changes, from 2.262 to 1.833.

Problem 4

This is like the problem in Section 12.4.2 of Wild and Seber that we did for homework. The slope is 1.0152 and its standard error is 0.2719 and the degrees of freedom is 18 (all read directly from the printout).

The t critical value for 18 degrees of freedom and 95% confidence (from Appendix A6 in Wild and Seber) is 2.101. Thus the margin of error for the confidence interval is

$$2.101 \times 0.2719 = 0.5712619$$

Thus the interval is 1.0152 ± 0.5712619, if not rounded, and 1.02 ± 0.57, if more sensibly rounded.