HW7

Section 7.1 Exercise
17-27, page 300.
43, page 301.

17. point
18. critical value
19. margin of error
20. increase
21. True
22. False.
23. True
25. 1.96
26. 1.44
27. 2.05

43, page 301.

a. $\bar{x} \pm z_{0.005}\frac{\sigma}{\sqrt{n}} = 458 \pm 2.576\frac{116}{\sqrt{100}} = 458 \pm 30 = (428, 488)$.

b. The margin of error would be larger with a smaller sample size.
Note margin of error $= z\frac{\sigma}{\sqrt{n}}$, a smaller n will make it larger.

c. The margin of error will be smaller for a lower confidence level because the critical value z will be smaller. e.g., z=1.645 for 90% CI, while z=1.96 for 95% CI.

d. Since 500 is not included in the confidence interval, it is unlikely the mean score is greater than 500.

Section 7.2 Exercise
7, 8, 9, 10, 11, 31, 38, 41. page 312-314.

7. d.f. =11
8. standard normal
9. False. The student' s t distribution is more spread than the standard normal curve.
10. True.
11. a. 2.074; b. 2.920,; c. 2.567; d. 2.763.
31. From the data we can get
$\bar{x} = 20.38, s = 0.838$. For n =6, d.f.=5, $t_{0.025} = 2.571$.

a. A $95\% CI$ is:
$20.38 \pm 2.571\frac{0.838}{\sqrt{6}} = (19.50, 21.26)$ percent.

b. Since confidence interval includes values greater than 21 percent, it is reasonable to believe that the content of spinach may be greater than 21 percent.

38. Eliminate the outlier 24, we have $\bar{x} = 7.36, s = 0.748$, with $n = 7, d.f. = 6, t_{0.025} = 2.447$, and a 95% CI is
$7.36 \pm 2.447 * \frac{0.748}{\sqrt{7}} = (6.67, 8.05)$ hours.
Leaving the outlier in the data, we have $\bar{x} = 9.4375, s = 5.92$, and
$t_{0.025} = 2.365$, a 95% CI is

$9.4375 \pm 2.365\frac{5.92}{\sqrt{8}} = (4.49, 14.39)$ hours.

The two results are noticeably different. That is, the outlier value greatly changed the result. Therefore, it is important to check for outlier to avoid misleading results.

41. Because the 43 presidents constitute the whole population and the mean 70.8 inches is the population mean, we do not need to estimate it anymore.

Section 7.3 Exercise

7, 8, 9, 10, 24, 30, 34, page 325-327.

7. standard error.

8. 0.5.

9. True. Note $\hat{p} = 0.5$ gives a larger n than any other $\hat{p}$ values.

10. False. A larger sample size produces a smaller margin of error.

24. a. The point estimate is $\hat{p} = \frac{42}{120} = 0.350$.

b. A 98% CI is

$0.35 \pm 2.326 * \sqrt{0.35 * 0.65/120} = 0.35 \pm 0.101 = (0.249, 0.451)$.

c. As the confidence interval includes the value 0.39, so it does not contradict the statement.

30. If we use $\hat{p} = 0.34$, the needed sample size is

$n = \hat{p}(1-\hat{p})(\frac{z_{\alpha/2}}{m})^2 = 0.34 * 0.67(1.96/0.03)^2 = 958.$

If no estimate of p is available, we can use $\hat{p} = 0.5$ and the needed sample size is

$n = \hat{p}(1-\hat{p})(\frac{z_{\alpha/2}}{m})^2 = 0.5 * 0.5(1.96/0.03)^2 = 1068.$

34. In this data set, we do not have at least 10 companies in each category (we have 3 in one category and 17 in the other category). Use the CI for small sample sizes, we have

$\tilde{p} = \frac{3+2}{20+4} = 0.208$, and a 98% CI is:

$0.208 \pm 2.33\sqrt{0.208 * 0.792/24} = 0.208 \pm 0.193 = 0.015, 0.401.$