Solution Tips for Statistics Summary Exercises

1. section 1.1

2. section 1.2

3. section 3.3 $s \approx \frac{\text{range}}{4} \approx \frac{74-48}{4}$

4. sections 3.2, 3.3

   sort the values from low to high and/or use a calculator
   {0,0,1,2,3,3,4,5,6,8,9,9,9,11,14,15}

   a. $\bar{x} = \frac{\sum x}{n} = \frac{99}{16} = 6.2$

   b. median = $\frac{5+6}{2}$

   c. mode = 9

   d. range = 15 – 0

   e. midrange = $\frac{15+0}{2}$

   f. mean and median are to the right of the mode

5. section 3.2

   a. There are a total of 28 data values. The median would be the value between the 13th and 14th values. The third class contains these values and the median.

   b. class width = 111.0 – 80.0 = 31.0

   c. The mode is in the class with the highest frequency.

6. section 2.2 relative frequency = $\frac{\text{class frequency}}{\text{total \# of values}}$

7. section 3.3 Empirical Rule: The values are within 3 SD of the mean.

8. Section 3.2 and 3.3 Find the class midpoints and use the formulas or calculator to find answers.

9. section 3.4 $z = \frac{96.6-98.2}{0.62} = -2.58$

10. section 3.4 student X : $z = \frac{92-71}{15} = 1.40$

    student Y: $z = \frac{688-493}{150} = 1.30$

11. section 3.4 — maximum usual value = $\mu + 2\sigma = 99.44$
minimum usual value = $\mu - 2\sigma = 99.44$
99.38° is within the usual range of values.

12. section 4.2 — $0 \le P(A) \le 1$

13. section 4.6 — Fundamental Counting Rule: $8 \bullet 8 \bullet 8 \bullet 8 \bullet 8 = 8^5$

14. section 4.6 — Fundamental Counting Rule: $8 \bullet 7 \bullet 6 \bullet 5 \bullet 4$

15. section 4.6 — Fundamental Counting Rule: $1 \bullet 8 \bullet 8 \bullet 8 \bullet 8$
There is only 1 choice for the first position.

16. section 4.6 — Fundamental Counting Rule: $8 \bullet 8 \bullet 8 \bullet 8 \bullet 4$
There are 4 choices for the last position (1,3,5,7)

17. section 4.6 — ${}_8C_5$

18. section 4.6 — ${}_8P_5$

19. section 4.4 — $(0.17)(0.17)(0.17)(0.17) = (0.17)^4$

20. section 4.5 — P(1 correct answer) = 0.25
P(1 wrong answer) = 0.75
P(at least 1 correct) = 1 – P(none correct)
= 1 – P(all wrong)
= $1 - (0.75)^{12}$

21. section 4.4 — P(K and Q) = $\frac{4}{52} \bullet \frac{4}{51}$

22. section 4.4 — P(pair) = $\frac{52}{52} \bullet \frac{3}{51}$ The second card has to match the first card.

23. section 4.3 — P(face card or diamond) = $\frac{12 + 13 - 3}{52}$

24. section 5.2 — $P \le 0.05$

25. section 4.4 — P(neither green) = $\frac{8}{10} \bullet \frac{7}{9}$

26. section 4.2 — odds = $\frac{\#\text{ favorable}}{\#\text{ unfavorable}} = \frac{3}{7}$ or 3 : 7
probability: denominator = total
odds: numerator + denominator = total

27. section 4.3 — P(on-time) = $\frac{92}{114}$

28. section 4.4 P(Statewide and late) = $\frac{3}{114}$

29. section 4.3 P(Southern or on-time) = $\frac{45+92-34}{114}$

30. section 4.5 P(late | Westward) = $\frac{8}{38}$

31. section 4.6 Fundamental Counting Rule 3•7•12

32. section 4.6 P(at least 6 B) = P(6B and 2G) + P(7B and 1G) + P(8B)
$= {}_{12}C_6 \bullet {}_9C_2 + {}_{12}C_7 \bullet {}_9C_1 + {}_{12}C_8$

33. section 5.2 Expected value = $\mu = \sum x \bullet P(x) = 3\left(\frac{3}{12}\right) + (-1)\left(\frac{9}{12}\right) = 0$

34. section 5.3 fixed number of trials
2 outcomes
probability remains constant for each trial
trials are independent

35. section 4.3 D and E share 2 and 4

36. section 4.3 D and F share 3

37. section 4.3 E and F share no outcomes

38. section 4.4 Joe is late because he forgot to set his alarm clock.

39. section 4.4 There is no connection linking milk being on sale and notebook paper being on sale.

40. section 4.4 There is no connection linking a grade of "A" to being a girl.

41. section 5.3 n = 30; x = 5; p = 0.20
Use the formula or a calculator to find the probability.

42. section 5.4 $\mu = np = 800(0.7) = 560$
$\sigma = \sqrt{800 \bullet 0.7 \bullet 0.3} = 12.96$
maximum usual value = $\mu + 2\sigma \approx 586$
minimum usual value = $\mu - 2\sigma \approx 534$
540 is within the range of usual values.

43. section 5.4 Expected value = $\mu = np = 20(0.25) = 5$

44. section 6.2 P = 0.9761 – 0.2420

45. section 6.2 P = 1 – 0.0344

46. section 6.3 $z = \frac{53-60}{4}$ P(x<53) = P(z<-1.75) = 0.0401

47. section 6.3 $z = \frac{16.1-15.2}{0.9}$ P(x>16.1)=P(z>1.00) = 1 – 0.8413

48. section 6.2 range = 36 – 22 = 14 $p = \frac{1}{14}$

$P(x<25) = \left(\frac{1}{14}\right)(25-22) = \frac{3}{14}$

49. section 6.3 A = 0.6 ≈ 0.5987 $z = 0.25 = \frac{x-48.3}{8.1}$

x = 48.3 + (8.1)(0.25) = 50.3

50. section 5.3 P(x≥6) = P(6) + P(7) + P(8) = 0.10938 + 0.03125 + 0.00391 = 0.145
n = 8; p = 0.5

51. section 6.5 $\sigma_{\bar{x}} = \frac{1.8}{\sqrt{40}} = 0.285$ $z = \frac{7.7-8.4}{0.285} = -2.46$

$P(\bar{x}>7.7)=P(z>-2.46) = 1 - 0.0069$

52. section 7.4 α = 0.10; df = 41, use 40

53. section 7.2, 7.3 $\bar{x} - E = 33.61$

$\bar{x} + E = 45.23$ $2\bar{x} = 78.84$ $\bar{x} = 39.42$ E = 45.23 – 39.42

54. section 7.4 t-distribution α = 0.10 n = 40, df = 39, use 38

$t_{\frac{\alpha}{2}} = 1.686$ $E = 1.686\left(\frac{8.2}{\sqrt{40}}\right) = 2.186$

103.4 – 2.186 < μ < 103.4 + 2.186 101.2 < μ < 105.6

55. section 7.3 α = 0.06; use s = 8.2; E = 1.5

$z_{\frac{\alpha}{2}} = 1.88$ $n = \left(\frac{1.88 \bullet 8.2}{1.5}\right)^2 = 105.6$ n = 106 {round up}

56. section 7.3 If n becomes larger, the value of E becomes smaller because the calculations involve dividing by a bigger number.

57. section 7.3 A higher confidence level results in a larger critical value. The value of E will increase because the calculations involve multiplying by a bigger number.

58. section 7.2 n = 863; x = 61; α = 0.10; $\hat{p}$ = 0.0707; $\hat{q}$ = 0.9293

$z_{\frac{\alpha}{2}} = 1.645$ $E = 1.645\sqrt{\frac{0.0707 \bullet 0.9293}{863}} = 0.0144$

0.0707 < p < 0.0851

59. section 7.2 n = 220; $\hat{p}$ = 0.25; $\hat{q}$ = 0.75; α = 0.05; E = 0.02

$z_{\frac{\alpha}{2}} = 1.96$ $n = \frac{(1.96)^2 \bullet 0.25 \bullet 0.75}{(0.02)^2} = 1800.75$ n=1801

60. section 8.2 claim: $\mu > 99.2$ false claim: $\mu \leq 99.2$
H_0: $\mu = 99.2$ H_1: $\mu > 99.2$ right-tailed

61. section 8.2 claim: $p \leq 0.34$ false claim: $p > 0.34$
H_0: $p = 0.34$ H_1: $p > 0.34$ right-tailed

62. section 8.2 claim: $\mu = 48{,}000$ false claim: $\mu \neq 48{,}000$
H_0: $\mu = 48{,}000$ H_1: $\mu \neq 48{,}000$ two-tailed

63. section 10.2 n = 10; α = 0.05; critical value = cv = 0.632
$|-0.804| > 0.632$ There is linear correlation.

64. section 10.2, 10.3 When r is negative, the linear regression equation has negative slope.

65. section 8.5 n = 45; $\bar{x}$ = 13.6; s = 1.8; α = 0.05; df = 44, use 40
claim: $\mu \geq 14$; false claim: $\mu < 14$
H_0: $\mu = 14$; H_1: $\mu < 14$; ; left-tailed; cv = -1.684
test stat: $t = \frac{13.6 - 14}{\frac{1.8}{\sqrt{45}}} = -1.49$; Fail to reject H_0

66. section 8.3 n = 550; x = 311; $\hat{p}$ = 0.565; α = 0.01
claim: p = 0.62; false claim: $p \neq 0.62$
H_0: p = 0.62; H_1: $p \neq 0.62$; q = 0.38; two-tailed; cv = ± 2.575
test stat: $z = \frac{0.565 - 0.62}{\sqrt{\frac{0.62 \bullet 0.38}{550}}} = -2.66$; Reject H_0

67. section 8.4 n = 40; $\bar{x}$ = 23.1; σ = 2.4; σ = 0.04;
claim: $\mu > 22$; false claim: $\mu \leq 22$
H_0: $\mu = 22$; H_1: $\mu > 22$; ; right-tailed; cv = 1.75
test stat: $z = \frac{23.1 - 22}{\frac{2.4}{\sqrt{40}}} = 2.90$; Reject H_0