

Solutions to Homework 4

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Exercises, Chapter 7: Exercises 67, 68, 69, 71, and Chapter 8: Exercises 95, 96, 97

- Chapter 7, Exercise 67: (a) True, by the central limit theorem the sample means approach the population mean. (b) True, by the central limit theorem the means have to be normally distributed. (c) False, there is a factor of \sqrt{n} from the central limit theorem.
- Chapter 7, Exercise 68: (a) $N(36, 10/\sqrt{16}) = N(36, 2.5)$ (b) $P(\bar{X} > 5)$ is the same as the probability that \bar{X} is measured above 5, which is more than 12 standard deviations from the mean. Thus, there is almost a 100 percent probability that $\bar{X} > 5$. (c) It turns out that -0.67 standard deviations below the mean of a normal distribution is the location of Q1. This is a location of 34.3 calories (36 minus 0.67 times 2.5).
- Chapter 7, Exercise 69: (a) X is the typical salary per year in USD. (b) \bar{X} is the average salary per year drawn from the wedge distribution. (c) $\bar{X} = N(2000, 8000/\sqrt{1000}) = N(2000, 253)$. (d) In the wedge distribution described above, the mean is close to zero but there is a long tail. (e) The former is closer to the mean, and the distribution of the mean is normal.
- Chapter 7, Exercise 71: B
- Chapter 8, Exercise 95: (a) i) 71 ii) 2.8 iii) 48 (b) X is the distribution of heights, and \bar{X} is the mean of that distribution. (c) If we're measuring the mean, we use the normal distribution. However, the small sample size would require the Student-t distribution rather than the normal if we were computing t-scores. (d) The standard error in the mean is 0.4 inches, so the confidence interval is $[71 - 2 \times 0.4, 71 + 2 \times 0.4] = [70.2, 71.8]$ inches. (e) The level of confidence will increase, because the same confidence interval would correspond to more standard deviations from the mean.
- Chapter 8, Exercise 96: (a) X is the length of conferences in days and \bar{X} is the mean of the sample. (b) The normal distribution will describe the mean of the sample, following the CLT. (c) [3.66, 4.22] days
- Chapter 8, Exercise 97: (a) i) 23.6 hours ii) 7.0 hours iii) 100 (b) X is the number of hours to complete the tax forms and \bar{X} is the sample mean. (c) Normal distribution, following central limit theorem with a large n value. (d) 1.645 standard deviations above and below the mean corresponds to the 90 CL. Thus, $[23.6 - 1.645 * 7/\sqrt{100}, 23.6 + 1.645 * 7/\sqrt{100}] = [22.4, 24.8]$ hours.