7.12: Solutions

1.

mean = 4 hours; standard deviation = 1.2 hours; sample size = 16

3.

a. Answers may vary.
b. 3.5, 4.25, 0.2441

5.

The fact that the two distributions are different accounts for the different probabilities.

7.

0.3345

9.

7,833.92

11.

0.0089

13.

7,326.49

15.

77.45%

17.

0.4207

19.

3,888.5

21.

0.8186

23.

5

25.

0.9772

27.

The sample size, n, gets larger.

29.

49

31.

26.00

33.

0.1587

35.

1,000

37.

1. $U(24, 26)$, 25, 0.5774
2. $N(25, 0.0577)$
3. 0.0416

39.

0.0003

41.

25.07

43.

1. N(2,500, 5.7735)
2. 0

45.

2,507.40

47.

1. 10
2. 110110" role="presentation" style="position: relative;">$\frac{1}{10}$ $\frac{1}{10}$

49.

N (10, 108)(10, 108)" role="presentation" style="position: relative;">$\left(10,\ \frac{10}{8}\right)$ $\left(10, \frac{10}{8}\right)$

51.

0.7799

53.

1.69

55.

0.0072

57.

391.54

59.

405.51

61.

1. X = amount of change students carry
2. X ~ E(0.88, 0.88)
3. x¯x¯" role="presentation" style="position: relative;">$\bar{x}\bar{x}$ = average amount of change carried by a sample of 25 sstudents.
4. x¯x¯" role="presentation" style="position: relative;">$\bar{x}\bar{x}$ ~ N(0.88, 0.176)
5. 0.0819
6. 0.4276
7. The distributions are different. Part a is exponential and part b is normal.

63.

1. length of time for an individual to complete IRS form 1040, in hours.
2. mean length of time for a sample of 36 taxpayers to complete IRS form 1040, in hours.
3. N(10.53, 13)(10.53, 13)" role="presentation" style="position: relative;">$\left(10.53,\ \frac{1}{3}\right)$ $\left(10.53, \frac{1}{3}\right)$
4. Yes. I would be surprised, because the probability is almost 0.
5. No. I would not be totally surprised because the probability is 0.2312

65.

1. the length of a song, in minutes, in the collection
2. U(2, 3.5)
3. the average length, in minutes, of the songs from a sample of five albums from the collection
4. N(2.75, 0.0660)
5. 2.71 minutes
6. 0.09 minutes

67.

1. True. The mean of a sampling distribution of the means is approximately the mean of the data distribution.

2. True. According to the Central Limit Theorem, the larger the sample, the closer the sampling distribution of the means becomes normal.
3. False. The standard deviation of the sample distribution of the means will decrease as the sample size increases; however, the standard deviation of the sample distribution of the means will not equal the standard deviation of X.

69.

1. *X* = the yearly income of someone in a developing country
2. the average salary from samples of 1,000 residents of a developing country
3. X¯X¯" role="presentation" style="position: relative;">$\overline{X}$ $\overline{X}$ ~ *N*(2000, 80001000)(2000, 80001000)" role="presentation" style="position: relative;">$\left(2000,\ \frac{8000}{\sqrt{1000}}\right)$ $\left(2000, \frac{8000}{\sqrt{1000}}\right)$
4. Very wide differences in data values can have averages smaller than standard deviations.
5. The distribution of the sample mean will have higher probabilities closer to the population mean.
   P(2000 < x¯x¯" role="presentation" style="position: relative;">$\bar{x}$ $\bar{x}$ < 2100) = 0.1537
   P(2100 < x¯x¯" role="presentation" style="position: relative;">$\bar{x}$ $\bar{x}$ < 2200) = 0.1317

71.

b

73.

1. the total length of time for nine criminal trials
2. *N*(189, 21)
3. 0.0432
4. 162.09; ninety percent of the total nine trials of this type will last 162 days or more.

75.

1. *X* = the salary of one elementary school teacher in the district
2. *X* ~ *N*(44,000, 6,500)
3. *ΣX* ~ sum of the salaries of ten elementary school teachers in the sample
4. *ΣX* ~ *N*(44000, 20554.80)
5. 0.9742
6. $52,330.09
7. 466,342.04
8. Sampling 70 teachers instead of ten would cause the distribution to be more spread out. It would be a more symmetrical normal curve.
9. If every teacher received a $3,000 raise, the distribution of *X* would shift to the right by $3,000. In other words, it would have a mean of $47,000.

77.

1. *X* = the closing stock prices for U.S. semiconductor manufacturers
2. i. $20.71; ii. $17.31; iii. 35
3.
4. Exponential distribution, *X* ~ *Exp*(120.71)(120.71)" role="presentation" style="position: relative;">$\left(\frac{1}{20.71}\right)$ $\left(\frac{1}{20.71}\right)$
5. Answers will vary.
6. i. $20.71; ii. $11.14
7. Answers will vary.
8. Answers will vary.
9. Answers will vary.
10. *N*(20.71, 17.315)(20.71, 17.315)" role="presentation" style="position: relative;">$\left(20.71,\ \frac{17.31}{\sqrt{5}}\right)$ $\left(20.71, \frac{17.31}{\sqrt{5}}\right)$

79.

b

81.

b

83.

a

85.

1. 0
2. 0.1123
3. 0.0162
4. 0.0003
5. 0.0268

87.

1. Answers may vary.
2. X¯X¯" role="presentation" style="position: relative;">$\overline{X}$ $\overline{X}$ ~ N(60, 925)(60, 925)" role="presentation" style="position: relative;">$\left(60, \frac{9}{\sqrt{25}}\right)$ $\left(60, \frac{9}{\sqrt{25}}\right)$
3. 0.5000
4. 59.06
5. 0.8536
6. 0.1333
7. N(1500, 45)
8. 1530.35
9. 0.6877

89.

1. $52,330
2. $46,634

91.

- We have μ = 17, σ = 0.8, x¯x¯" role="presentation" style="position: relative;">$\bar{x}$ $\bar{x}$ = 16.7, and n = 30. To calculate the probability, we use `normalcdf` (lower, upper, μ, σnσn" role="presentation" style="position: relative;">$\frac{\sigma}{\sqrt{n}}$ $\frac{\sigma}{\sqrt{n}}$) = `normalcdf` (E–99,16.7,17,0.830)(E–99,16.7,17,0.830)" role="presentation" style="position: relative;">$\left(E\text{–}99,16.7,17,\frac{0.8}{\sqrt{30}}\right)$ $\left(E\text{–}99,16.7,17,\frac{0.8}{\sqrt{30}}\right)$= 0.0200.
- If the process is working properly, then the probability that a sample of 30 batteries would have at most 16.7 lifetime hours is only 2%. Therefore, the class was justified to question the claim.

93.

1. For the sample, we have n = 100, x¯x¯" role="presentation" style="position: relative;">$\bar{x}$ $\bar{x}$ = 0.862, s = 0.05
2. Σx¯Σx¯" role="presentation" style="position: relative;">$\Sigma\bar{x}$ $\Sigma\bar{x}$ = 85.65, Σs = 5.18
3. `normalcdf` (396.9,E99,(465)(0.8565),(0.05)(465465" role="presentation" style="position: relative;">$\sqrt{465}$ $\sqrt{465}$)) ≈ 1
4. Since the probability of a sample of size 465 having at least a mean sum of 396.9 is appproximately 1, we can conclude that Mars is correctly labeling their M&M packages.

95.

Use `normalcdf` (E–99,1.1,1,170)(E–99,1.1,1,170)" role="presentation" style="position: relative;">$\left(E\text{–}99,1.1,1,\frac{1}{\sqrt{70}}\right)$ $\left(E\text{–}99,1.1,1,\frac{1}{\sqrt{70}}\right)$= 0.7986. This means that there is an 80% chance that the service time will be less than 1.1 hours. It could be wise to schedule more time since there is an associated 20% chance that the maintenance time will be greater than 1.1 hours.

97.

We assume that the weights of coins are normally distributed in the population. Since we have `normalcdf` (5.111,5.291,5.201,0.065280)(5.111,5.291,5.201,0.065280)" role="presentation" style="position: relative;">$\left(5.111,5.291,5.201,\frac{0.065}{\sqrt{280}}\right)$ $\left(5.111,5.291,5.201,\frac{0.065}{\sqrt{280}}\right)$≈ 0.8338, we expect (1 – 0.8338)280 ≈ 47 coins to be rejected.