6.11: Solutions

1.

ounces of water in a bottle

3.

2

5.

–4

7.

–2

9.

The mean becomes zero.

11.

$z = 2$

13.

$z = 2.78$

15.

$x = 20$

17.

$x = 6.5$

19.

$x = 1$

21.

$x = 1.97$

23.

$z = –1.67$

25.

$z \approx –0.33$

27.

0.67, right

29.

3.14, left

31.

about 68%

33.

about 4%

35.

between –5 and –1

37.

about 50%

39.

about 27%

41.

The lifetime of a wearable fitness device measured in years.

43.

$P(x < 1)$

45.

Yes, because they are the same in a continuous distribution: $P(x = 1) = 0$

47.

1 – $P(x < 3)$ or $P(x > 3)$

49.

1 – 0.543 = 0.457

51.

0.0013

53.

56.03

55.

0.1186

57.

1. Answers may vary.
2. 3, 0.1979

59.

1. Answers may vary.
2. 0.70, 4.78 years

61.

c

63.

1. Use the *z*-score formula. z = –0.5141. The height of 77 inches is 0.5141 standard deviations below the mean. An NBA player whose height is 77 inches is shorter than average.
2. Use the *z*-score formula. z = 1.5424. The height 85 inches is 1.5424 standard deviations above the mean. An NBA player whose height is 85 inches is taller than average.
3. Height = 79 + 3.5(3.89) = 92.615 inches, which is taller than 7 feet, 8 inches. There are very few NBA players this tall so the answer is no, not likely.

65.

1. iv
2. Kyle’s blood pressure is equal to 125 + (1.75)(14) = 149.5.

67.

Let X = an SAT math score and Y = an ACT math score. Use the z-score formula.

1. X = 720 : z=720-520115=1.74z=720-520115=1.74" role="presentation" style="position: relative;">$z=\frac{720-520}{115}=1.74$ $z=\frac{720-520}{115}=1.74$. The exam score of 720 is 1.74 standard deviations above the mean of 520.
2. z = 1.5
   The math SAT score is 520 + 1.5(115) ≈ 692.5. The exam score of 692.5 is 1.5 standard deviations above the mean of 520.
3. X – μσX – μσ" role="presentation" style="position: relative;">$\frac{X-\mu}{\sigma}$ $\frac{X-\mu}{\sigma}$ = 700 – 514117700 – 514117" role="presentation" style="position: relative;">$\frac{700-514}{117}$

$\frac{700-514}{117}$ ≈ 1.59, the *z*-score for the SAT.

Y – μσY – μσ" role="presentation" style="position: relative;">$\frac{Y-\mu}{\sigma}$ $\frac{Y-\mu}{\sigma}$ = 30 – 215.330 – 215.3" role="presentation" style="position: relative;">$\frac{30-21}{5.3}$ $\frac{30-21}{5.3}$ ≈ 1.70, the *z*-scores for the ACT. With respect to the test they took, the person who took the ACT did better (has the higher *z*-score).

69.

c

71.

d

73.

1. $X \sim N(66, 2.5)$
2. 0.5404
3. No, the probability that an Asian male is over 72 inches tall is 0.0082

75.

1. $X \sim N(36, 10)$
2. The probability that a person consumes more than 40% of their calories as fat is 0.3446.
3. Approximately 25% of people consume less than 29.26% of their calories as fat.

77.

1. *X* = number of hours that a Chinese four-year-old in a rural area is unsupervised during the day.
2. $X \sim N(3, 1.5)$
3. The probability that the child spends less than one hour a day unsupervised is 0.0918.
4. The probability that a child spends over ten hours a day unsupervised is less than 0.0001.
5. 2.21 hours

79.

1. *X* = the distribution of the number of days a particular type of criminal trial will take
2. $X \sim N(21, 7)$
3. The probability that a randomly selected trial will last more than 24 days is 0.3336.
4. 22.77

81.

1. mean = 5.51, *s* = 2.15
2. Answers may vary.
3. Answers may vary.
4. Answers may vary.
5. $X \sim N(5.51, 2.15)$
6. 0.6029
7. The cumulative frequency for less than 6.1 minutes is 0.64.
8. The answers to part f and part g are not exactly the same, because the normal distribution is only an approximation to the real one.
9. The answers to part f and part g are close, because a normal distribution is an excellent approximation when the sample size is greater than 30.
10. The approximation would have been less accurate, because the smaller sample size means that the data does not fit normal curve as well.

83.

1. mean = 60,136
   s = 10,468
2. Answers will vary.
3. Answers will vary.

4. Answers will vary.
5. $X \sim N(60136, 10468)$
6. 0.7440
7. The cumulative relative frequency is 43/60 = 0.717.
8. The answers for part f and part g are not the same, because the normal distribution is only an approximation.

85.

- $n = 100$; $p = 0.1$; $q = 0.9$
- $\mu = np = (100)(0.10) = 10$
- σ = npqnpq" role="presentation" style="position: relative;">$\sqrt{npq}\sqrt{npq}$ = (100)(0.1)(0.9)(100)(0.1)(0.9)" role="presentation" style="position: relative;">$\sqrt{(100)(0.1)(0.9)}\sqrt{(100)(0.1)(0.9)}$ = 3

1. $z = \pm1$: $x_1 = \mu + z\sigma = 10 + 1(3) = 13$ and $x2 = \mu - z\sigma = 10 - 1(3) = 7$. 68% of the defective cars will fall between seven and 13.
2. $z = \pm2$: $x_1 = \mu + z\sigma = 10 + 2(3) = 16$ and $x2 = \mu - z\sigma = 10 - 2(3) = 4$. 95 % of the defective cars will fall between four and 16
3. $z = \pm3$: $x_1 = \mu + z\sigma = 10 + 3(3) = 19$ and $x2 = \mu - z\sigma = 10 - 3(3) = 1$. 99.7% of the defective cars will fall between one and 19.

87.

- $n = 190$; p = 1515" role="presentation" style="position: relative;">$\frac{1}{5}\frac{1}{5}$ = 0.2; $q = 0.8$
- $\mu = np = (190)(0.2) = 38$
- σ = npqnpq" role="presentation" style="position: relative;">$\sqrt{npq}\sqrt{npq}$ = (190)(0.2)(0.8)(190)(0.2)(0.8)" role="presentation" style="position: relative;">$\sqrt{(190)(0.2)(0.8)}\sqrt{(190)(0.2)(0.8)}$ = 5.5136

1. For this problem: $P(34 < x < 54)$ = normalcdf(34,54,48,5.5136) = 0.7641
2. For this problem: $P(54 < x < 64)$ = normalcdf(54,64,48,5.5136) = 0.0018
3. For this problem: $P(x > 64)$ = normalcdf(64,10^{99},48,5.5136) = 0.0000012 (approximately 0)