Lesson 6.1.2

6-10. a. mean = 10, median = 9.8, standard deviation = 2.2

b. mean = 24, variance = 43.56

c. mean = 13, standard deviation = 4.4

6-11. a. The mean and standard deviation doubled. The variance quadrupled. $E(X) = 3.9$ and $E(2X) = 7.8$; $\text{Var}(X) = 1.69$ and $\text{Var}(2X) = 6.76$; $\text{StDev}(X) = 1.3$ and $\text{StDev}(2X) = 2.6$.

b. The mean went up by 5. The variance and standard deviation did not change. $E(X + 5) = 8.9$, $\text{Var}(X + 5) = 1.69$, $\text{StDev}(X + 5) = 1.3$.

c. The mean is doubled and five higher. The variance is quadrupled. The standard deviation is doubled. $E(2X + 5) = 12.8$, $\text{Var}(2X + 5) = 6.76$, $\text{StDev}(2X + 5) = 2.6$.

6-12. a. The spins are independent. $P(\text{A} \cap \text{B}) = P(\text{A}) \cdot P(\text{B})$

b. See answers in table below in bold.

Probability Distribution for $X + X$		First Spin: 2 | 0.3	First Spin: 4 | 0.2	First Spin: 5 | 0.5
Second Spin	2 | 0.3	4 | 0.09	6 | 0.06	7 | 0.15
	4 | 0.2	6 | 0.06	**8 | 0.04**	**9 | 0.10**
	5 | 0.5	**7 | 0.15**	**9 | 0.10**	**10 | 0.25**

The mean, $E(X + X)$, is $E(X) + E(X) = 7.80$. The variance, $\text{Var}(X + X)$, is $\text{Var}(X) + \text{Var}(X) = 3.38$. The standard deviation for $X + X$ is $\sqrt{\text{Var}(X) + \text{Var}(X)} = 1.838$.

6-13. To observe $2X$, you would spin the spinner once and double the number that you see. To observe $X + X$, you would observe X once, observe X again, and add the two outcomes. Physically these are very different things.

6-14. a. $\mu_Y = 6$, $\sigma^2_Y = 4$, $\sigma_Y = 2$

b. See answers in table below in bold. The mean, $E(X + Y)$, is $E(X) + E(Y) = 9.9$. The variance, $\text{Var}(X + Y)$, is $\text{Var}(X) + \text{Var}(Y) = 5.69$. The standard deviation for $X + Y$ is $\sqrt{\text{Var}(X) + \text{Var}(Y)} = 2.385$

Probability Distribution for $X + Y$		Spin: 2 | 0.3	Spin: 4 | 0.2	Spin: 5 | 0.5
Flip	4 | 0.5	6 | 0.15	8 | 0.1	**9 | 0.25**
	8 | 0.5	10 | 0.15	**12 | 0.1**	**13 | 0.25**

6-15. a. $\mu_C = 20,\ \sigma_c^2 = 18$, and $\sigma_C = \sqrt{18}$

b. $\mu_C = 28,\ \sigma_c^2 = 34$, and $\sigma_C = \sqrt{34}$

c. $\mu_C = 28,\ \sigma_c^2 = 52$, and $\sigma_C = \sqrt{52}$

d. $\mu_C = 20,\ \sigma_c^2 = 25$, and $\sigma_C = 5$

6-16. $\mu_X = 9.1,\ \sigma_X^2 = 13.89,\ \sigma_X = 3.727$

6-17. $\mu_Z = 8,\ \sigma_Z = \sqrt{52}$

6-18. a. $\mu_Z = 160$ and $\sigma_Z = 10$

b. It represents the sum of four independent observations of the random variable X.

c. It represents the mean of four independent observations of the random variable X.

d. $\mu_{\frac{1}{4}Z} = 40$ and $\sigma_{\frac{1}{4}Z} = 2.5$

6-19. a. $\mu_{X+X} = \$82$ and $\sigma_{X+X} = \$\sqrt{200}$

b. Using the normal distribution cdf and the results from part (a):
$P(X + X < 80) = 0.4438$

6-20. See possible diagram below. The test will indicate a person has the disease (positive result) in events A or D from the diagram, making the associated probability $0.0002997 + 0.0009997 = 0.0012994$. Of the probability of a positive test result, only in event A does the person have the disease. So if a person has a positive test result the probability they have the disease is only $\frac{0.0002997}{0.0012994} = 0.231$.

	Person has disease 0.0003	Person does not have disease 0.9997
Test is correct 0.999	A 0.0002997	B 0.9987003
Test is *not* correct 0.001	C 0.0000003	D 0.0009997 false positives