Section 5-2

21. a. $P(X = 3) = 0.041$

    b. $P(X \geq 3) = 0.041 + 0.005 + 0 + 0 = 0.046$

    c. The probability from part (b)

    d. Yes, because the probability of three or more failures is 0.046 which is very low (less than or equal to 0.05)

22. a. $P(X = 1) = 0.399$

    b. $P(X \leq 1) = 0.377 + 0.399 = 0.776$

    c. The result from part (b)

    d. No, because the probability of 0.776 is not very low (less than or equal to 0.05)

Section 5-3

27. $P(X \leq 2) = 0.000 + 0.004 + 0.033 = 0.037$; yes, because the probability of 2 or fewer peas with green pods is small (less than or equal to 0.05).

41. $1 - {}_{24}C_0 \cdot 0.006^0 \cdot 0.994^{24} = 0.134$. It is not unlikely for such a combined sample to test positive.

42. $1 - {}_{16}C_0 \cdot 0.00114^0 \cdot 0.99886^{24} = 0.0181$. It is unlikely for such a combined sample to test positive.

Section 5-5

10. a. $\mu = \dfrac{5469}{41} = 133.4$

    b. $P(133) = \dfrac{133.4^{133} \cdot e^{-133.4}}{133!} = 0.0346$

    c. No. Although the probability of exactly 133 earthquakes measured at 6.0 or higher on the Richter scale is quite small (0.0346), the number 133 is so close to the mean of 133.4 that this year would be quite ordinary, and it would not be unusual.

13. a. $P(2) = \dfrac{0.929^2 \cdot e^{-0.929}}{2!} = 0.17$

    b. The expected number of regions with exactly 2 hits is 98.2

    c. The expected number of regions with 2 hits is close to 93, which is the actual number of regions with 2 hits.

Section 6-2

11. $P(-0.84 < z < 1.28) = P(z < 1.28) - P(z < -0.84) = 0.8997 - 0.2005 = 0.6992$ (Tech: 0.6993)

12. $P(-1.07 < z < 0.67) = P(z < 0.67) - P(z < -1.07) = 0.7486 - 0.1423 = 0.6063$

22. $P(z > 1.82) = 1 - 0.9656 = 0.0344$

29. $P(-2.20 < z < 2.50) = P(z < 2.50) - P(z < -2.20) = 0.9938 - 0.0139 = 0.9799$

Section 6-3

27. a. The z score for a 308 day pregnancy is $\frac{308-268}{15}=2.67$ which corresponds to a probability of 0.0038 or 0.38%. Either a very rare event occurred or the husband is not the father.

    b. The z score corresponding to 3% is –1.87 which corresponds to a pregnancy of $-1.87\cdot 15+268=240$ days

32. a. The minimum weight has a z score of $\frac{5.64-5.67}{0.06}=-0.5$ which has a corresponding probability of 0.3085 and the maximum weight has a z score of $\frac{5.7-5.67}{0.06}=0.5$ which has a corresponding probability of 0.6915. Therefore, the percentage of quarters rejected is $1-(0.6915-0.3085)=0.6170$. (Tech: 61.71%.) That percentage is too high because most quarters will be rejected.

    b. The z score for a probability of the top 2.5% and the bottom 2.5% is 2 and –2 respectively. Therefore the weight minimum is $-2\cdot 0.06+5.67=5.5$ g and the weight maximum is $2\cdot 0.06+5.67=5.79$ g

Section 6-4

7. a. The mean of the population is $\mu=\frac{4+5+9}{3}=6$, and the variance is

$$\sigma^2=\frac{(4-6)^2+(5-6)^2+(9-6)^2}{3}=4.7$$

    b. The possible sample of size 2 are {(4, 4), (4, 5), (4, 9), (5, 4), (5, 5), (5, 9), (9, 4), (9, 5), (9, 9)} which have the following variances {0, 0.5, 12.5, 0.5, 0, 8, 12.5, 8, 0} respectively.

Sample Variance	Probability
0	3/9
0.5	2/9
8	2/9
12.5	2/9

7. (continued)

    c. The sample variances' mean is $\frac{3\cdot 0+2\cdot 0.5+2\cdot 8+2\cdot 12.5}{9}=4.7$

    d. Yes. The mean of the sampling distribution of the sample variances (4.7) is equal to the value of the population variance (4.7) so the sample variances target the value of the population variance.

9. a. The population median is 5

   b. The possible sample of size 2 are {(4, 4), (4, 5), (4, 9), (5, 4), (5, 5), (5, 9), (9, 4), (9, 5), (9, 9)} which have the following medians {4, 4.5, 6.5, 4.5, 5, 7, 6.5, 7, 9}

Sample Median	Probability
4	1/9
4.5	2/9
5	1/9
6.5	2/9
7	2/9
9	1/9

   c. The mean of the sampling distribution of the sampling median is
$$\frac{4+4.5+4.5+5+6.5+6.5+7+7+9}{9}=6$$

   d. No. The mean of the sampling distribution of the sample medians is 6, and it is not equal to the value of the population median of 5, so the sample medians do not target the value of the population median.

10. a. The proportion of odd numbers is 2/3 (there are two odd numbers from the population of 4, 5, and 9)

   b. The possible sample of size 2 are {(4, 4), (4, 5), (4, 9), (5, 4), (5, 5), (5, 9), (9, 4), (9, 5), (9, 9)} which have the following proportion of odd numbers {0, 0.5, 0.5, 0.5, 1, 1, 0.5, 1, 1}

Sample Proportion	Probability
0	1/9
0.5	4/9
1	4/9

   c. The mean of the sampling distribution of sample proportions is
$$\frac{0+0.5+0.5+0.5+0.5+1+1+1+1}{9}=\frac{2}{3}=0.67$$

10. (continued)

   d. Yes. The mean of the sampling distribution of the sample proportion of odd numbers is 2/3, and it is equal to the value of the population proportion of odd numbers of 2/3, so the sample proportions target the value of the population proportion