

The projected number of values that corresponds to each value of z is close to the actual number of data values. The data appear to be normally distributed.

12. There is a 2% probability the dealer will have a \$5,000 loss, and $0.02(5000) = \$100$. Because the cost of the insurance policy is \$110, the dealer should not purchase the policy. Alternatively, the expected value can be calculated: $EV = 0.02(4890) + 0.98(-110) = \$97.80 + (-107.80) = -\$10.00$. Because the expected value is $-\$10.00$, the dealer should not purchase the policy.

STUDY GUIDE: REVIEW

1. expected value
2. probability sample
3. hypothesis testing

8-1 MEASURES OF CENTRAL TENDENCY AND VARIATION

4. mean: 5.4; median: 6; mode: 8
5. mean: $13.\bar{3}$; median: 13; mode: 12, 13, 15
6. expected value
 $= 0(0.65) + 1(0.22) + 2(0.1) + 3(0.03)$
 $= 0.51$

8-2 DATA GATHERING

7. not representative; basketball players are likely to prefer sports
8. not representative; only homeowners are included in the sample, so not everyone in the city has a chance of being selected.
9. not representative; customers who prefer stores aren't likely to be at the website
10. $\frac{63}{100} = \frac{x}{1400}$; $x = 882$

8-3 SURVEYS, EXPERIMENTS, AND OBSERVATIONAL STUDIES

11. The treatment is working below fluorescent lights. The treatment group is those who are working below fluorescent lights. The control group is those who are working under incandescent lights.
12. The treatment is dogs receiving the company's brand of dog food. The treatment group is the households that were sent the company's brand. The control group is the households sent a brand other than the company's brand.

8-4 SIGNIFICANCE OF EXPERIMENTAL RESULTS

13. The vertical leap for both groups will be the same.

14. Comparing 5-number summaries:

	Without Inserts	With Inserts
Minimum	23	24
Q1	27	27.5
Median	30.5	30.5
Q3	34	35.5
Maximum	36	36

There is not a large difference, so we cannot reject the null hypothesis.

15. Yes; The null hypothesis is that the means of the population and sample are the same. Calculating the z -value: $\frac{390-400}{\frac{200}{\sqrt{3000}}} \approx -2.74$. Because $|z| \approx 2.74 > 1.96$, there is enough evidence to reject the claim.

SAMPLING DISTRIBUTIONS

16. Yes. The interval for Matthews is $62\% \pm 11\%$, or 51% to 73%. The interval for Harris is $38\% \pm 11\%$, or 27% to 49%. The intervals do not overlap, so the survey projects a clear winner.
17. No. The interval for vanilla is $53\% \pm 5\%$, or 48% to 58%. The interval for chocolate is $47\% \pm 5\%$, or 42% to 52%. The intervals overlap, so the survey does not project a clear winner.

BINOMIAL DISTRIBUTIONS

19. $(5 + 2x)^3$
 $= {}_3C_0 5^3 (2x)^0 + {}_3C_1 5^2 (2x)^1 + {}_3C_2 5^1 (2x)^2$
 $+ {}_3C_3 5^0 (2x)^3$
 $= 1 \cdot 125 + 3 \cdot 50x + 3 \cdot 20x^2 + 1 \cdot 8x^3$
 $= 125 + 150x + 60x^2 + 8x^3$
20. $(x - 2y)^4$
 $= {}_4C_0 x^4 (-2y)^0 + {}_4C_1 x^3 (-2y)^1 + {}_4C_2 x^2 (-2y)^2$
 $+ {}_4C_3 x^1 (-2y)^3 + {}_4C_4 x^0 (-2y)^4$
 $= 1 \cdot x^4 + 4 \cdot (-2x^3y) + 6 \cdot 4x^2y^2 + 4 \cdot (-8xy^3)$
 $+ 1 \cdot 16y^4$
 $= x^4 - 8x^3y + 24x^2y^2 - 32xy^3 + 16y^4$
21. expected value = $75 \cdot 0.65$
 $= 48.75$
 standard deviation = $\sqrt{75(0.65)(0.35)}$
 ≈ 4.13
22. $P(3) = {}_8C_3 \left(\frac{1}{6}\right)^3 \left(\frac{5}{6}\right)^5$
 $= 56 \left(\frac{1}{216}\right) \left(\frac{3125}{7776}\right) \approx 0.10$
 $P(\text{at least } 2)$
 $= 1 - P(0 \text{ or } 1)$
 $= 1 - \left[{}_8C_0 \left(\frac{1}{6}\right)^0 \left(\frac{5}{6}\right)^8 + {}_8C_1 \left(\frac{1}{6}\right)^1 \left(\frac{5}{6}\right)^7 \right]$
 ≈ 0.40

8-7 FITTING TO A NORMAL DISTRIBUTION

23. $z = \frac{73-77}{4} = -1$; "At least" indicates \geq so the area to the right of z is needed. The probability is $1 - 0.16 = 0.84$.
24. $z = \frac{83-77}{4} = 1.5$; "At most" indicates \leq so the area to the left of z is needed. The probability is 0.93.
25. $z = \frac{69-77}{4} = -2$ and $z = \frac{75-77}{4} = -0.5$. Use the area to the left of both z -values, then subtract the overlapping part. The area to the left of -2 is 0.02 and the area to the left of -0.5 is 0.31. Subtracting yields a probability of $0.31 - 0.02 = 0.29$.
26. $z = \frac{425-400}{25} = 1$; "Greater than" means using the area to the right of z . The probability is $1 - 0.84 = 0.16$.
27. $z = \frac{350-400}{25} = -2$ and $z = \frac{412.5-400}{25} = 0.5$. Use the area to the left of both z -values, then subtract the overlapping part. The area to the left of -2 is 0.02 and the area to the left of 0.5 is 0.69. Subtracting yields a probability of $0.69 - 0.02 = 0.67$.
28. $z = \frac{375-400}{25} = -1$; "Less than" means using the area to the left of z , so the probability is 0.16. $z = \frac{450-400}{25} = 2$; "Greater than" means using the area to the right of z , so the probability is $1 - 0.98 = 0.02$. Because $P(A \text{ or } B) = P(A) + P(B)$, then the probability that $x < 375$ or $x > 450$ is $0.16 + 0.02 = 0.18$.

8-8 ANALYZING DECISIONS

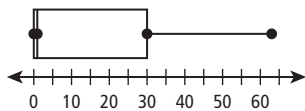
29. $EV = \frac{1}{6}(1) + \frac{2}{6}(2) + \frac{1}{6}(3) + \frac{2}{6}(5) = 3$
30. $EV = \frac{1}{6}(1) + \frac{3}{6}(2) + \frac{1}{6}(3) + \frac{1}{6}(5) = 2.5$
31. $EV = 26\frac{2}{3}$ cents;

There are 3 possibilities for the two coins: a quarter and a dime, a dime and a nickel, or a quarter and a nickel. Each is equally likely, with a probability of $\frac{1}{3}$.

Using the total value for each pair of coins: $EV = \frac{1}{3}(0.35) + \frac{1}{3}(0.15) + \frac{1}{3}(0.30) = 26\frac{2}{3}$.

CHAPTER TEST

1. minimum: 0 first quartile: 0.5
 maximum: 63 third quartile: 30
 median: 2 IQR: 29.5



2. No; mean ≈ 15.6 ; standard deviation ≈ 20.5 ; 3 standard deviations above the mean ≈ 77.1 , and $77.1 > 63$.

3. 12; the mean decreases from 104.4 to 96.7, and the standard deviation increases from ≈ 10.6 to ≈ 27.5 .

$$4. (3x + y)^4 = {}_4C_0(3x)^4y^0 + {}_4C_1(3x)^3y^1 + {}_4C_2(3x)^2y^2 + {}_4C_3(3x)^1y^3 + {}_4C_4(3x)^0y^4$$

$$= 1 \cdot 81x^4 + 4 \cdot 27x^3y + 6 \cdot 9x^2y^2 + 4 \cdot 3xy^3 + 1 \cdot y^4$$

$$= 81x^4 + 108x^3y + 54x^2y^2 + 12xy^3 + y^4$$

$$5. P(2) = {}_{10}C_2(0.15)^2(0.85)^8 \approx 0.28$$

$$6. P(\text{at least } 2) = 1 - P(0 \text{ or } 1)$$

$$= 1 - [{}_{10}C_0(0.15)^0(0.85)^{10} + {}_{10}C_1(0.15)^1(0.85)^9]$$

$$\approx 0.46$$

$$7. \frac{5}{30} = \frac{x}{372}; x = 62$$

8. Since it would be unethical to risk the respiratory systems of participants in an experiment, an observational study would be the best way to study this topic.

9. Since the machine is unlikely to cause any damage, an experiment is acceptable.

$$10. z = \frac{0.161-0.17}{\frac{0.03}{\sqrt{50}}} \approx -2.12; \text{ Because } -2.12 > 1.96,$$

there is enough evidence to reject the claim.

11. simple random

12. Because $\mu + \sigma$ is the mean plus one standard deviation, this can be represented by a z -value of 1. "Less than" indicates finding the area to the left of the z -value, so the probability is 0.84.

$$13. EV = \frac{5}{30}(1) + \frac{5}{30}(-1) + \frac{5}{30}(4) + \frac{5}{30}(-2) + \frac{5}{30}(-6) + \frac{5}{30}(13) + \frac{5}{30}(-4.5) = 0.6875$$