

Unit 5 & 6 Review - Probability and Data

Each event can occur in the given number of ways. Find the number of ways all of the events can occur.

- Event 1: 4 ways, Event 2: 9 ways
- Event 1: 6 ways, Event 2: 7 ways, Event 3: 8 ways
- _____ A lunch menu consists of 4 different kinds of sandwiches, 4 different kinds of soup, and 6 different drinks. How many choices are there for ordering a sandwich, a bowl of soup, and a drink?
a. 96 b. 3 c. 14 d. 414,720
4. Open-ended: Make up two six-letter words or names. One of the words should have no repeated letters. The other word should have at least one repeated letter. How many different six-letter permutations can be made of the letters in each word?
5. Open-ended: Make up two seven-letter words or names. One of the words should have no repeated letters. The other word should have at least one repeated letter. How many different seven-letter permutations can be made of the letters in each word?
6. How many different ways can you arrange six scoops on a cone?

Evaluate the factorial expression.

7. $1!$
8. $10!$
- _____ 9. $\frac{8!}{3!}$
a. 6 b. 6720 c. 40,320 d. 0
- _____ 10. $\frac{9!}{4! \cdot 3!}$
a. 362,880 b. 2520 c. 0 d. 144
- _____ 11. Eleven people are entered in a race. If there are no ties, in how many ways can the first two places come out?
a. 110 b. 22 c. 55 d. 78
12. Write the expression represented by ${}_{11}P_2$.

Find the number of permutations.

13. ${}_5P_3$

- _____ 14. Find the number of distinguishable permutations of the letters GAME.
a. 6 b. 12 c. 104 d. 24
15. Find the number of distinguishable permutations of the letters LUCKY.
16. Find the number of distinguishable permutations of the letters HONEST.
17. Find the number of distinguishable permutations of the letters SWEET.
18. How many different four-letter permutations are there for the letters in the word "minimum"?
19. How many different four-letter permutations are there for the letters in the word "toolroom"?
20. There are 8 finalists at a Quiz Bowl competition. The finalists must press a buzzer first in order to be eligible to answer a question.
a. In how many different ways can the 8 finalists be seated at a table with 8 buzzers?
b. Suppose the table has 12 buzzers. In how many different ways can the 8 finalists be seated at the 12 buzzers? Are there more ways the 8 finalists can be seated if there are 8 buzzers or if there are 12 buzzers? Explain.
c. The person with the highest final score is given a prize of \$300. The next 3 finishers are all given prizes of \$200. The rest of the contestants are given prizes of \$100. In how many distinct ways can the contestants win prizes? Explain.
21. From a group of eight boys and three girls, a boy and a girl will be selected to attend a conference. In how many possible ways can the selection be made?
- _____ 22. From a group of eight boys and seven girls, a boy and a girl will be selected to attend a conference. In how many ways can the selection be made?
a. 56 b. 63 c. 15 d. 64
23. Write the expression represented by ${}_6C_2$

Find the number of combinations.

24. ${}_{10}C_2$
25. You own 7 pairs of jeans and are taking 6 of them on vacation. In how many ways can you choose 6 pairs of jeans from the 7?
- _____ 26. You own 7 travel books and are taking 5 on vacation. In how many ways can you choose 5 travel books from the 7?
a. 35 b. 21 c. 5040 d. 105
- _____ 27. A committee is to consist of four members. If there are three men and four women available to serve on the committee, how many different committees can be formed?
a. 840 b. 21 c. 35 d. 48

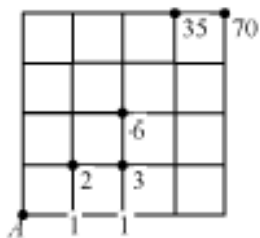
- _____ 28. A college has thirteen instructors qualified to teach a special computer lab course which requires two instructors to be present. How many different pairs of teachers could there be?
a. 66 b. 169 c. 39 d. 78
29. A four-person committee is chosen at random from a group of 15 people. How many different committees are possible?
30. A four-person committee is chosen at random from a group of 16 people. How many different committees are possible?
31. How many different 3-card hands can be drawn from a standard deck of 52 playing cards?
32. In a student body election, there are three candidates for president, four candidates for vice-president, and five candidates for secretary. How many possible groups of officers are there?
33. Write row 3 of Pascal's triangle. Use your answer to write $(x+y)^3$ in expanded form.
34. Write row 1 of Pascal's triangle. Use your answer to write $(a-b)^1$ in expanded form.

Writing:

35. Explain how you can use Pascal's triangle to answer the following question. Suppose you have just one penny, one nickel, one dime, and one quarter in your pocket. Assuming that each coin is equally likely to be selected, how many ways can you choose one coin?
36. Explain how to use patterns to write $(a+b)^6$ in expanded form.

Open-ended:

37. Copy the grid below. On the grid, record the number of ways you could travel from point A to the other points on the grid, moving only to the right and up. Several points have been completed for you. What do you notice about these numbers?

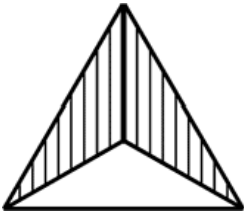


38. Expand $(q + 3r)^3$.

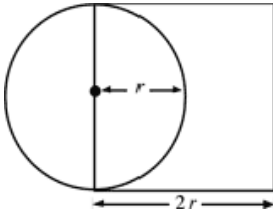
- _____ 39. Expand $(5p + 3q)^4$.
- $625p^4 + 1500p^3q + 1350p^2q^2 + 540pq^3 + 81q^4$
 - $625p^4 + 81q^4$
 - $625p^4 + 375p^3q + 225p^2q^2 + 135pq^3 + 81q^4$
 - $5p^4 + 3q^4$
40. Expand $(2s - 3t)^3$.
41. Expand $(3s - 2t)^3$.
42. Expand $(A - 2B)^4$.
43. What is the coefficient of the x^7y^3 term in the expansion of $(x + y)^{10}$?
44. What is the coefficient of the x^6y^4 term in the expansion of $(x + y)^{10}$?
45. What is the coefficient of the x^5y^5 term in the expansion of $(x + y)^{10}$?
46. Open-ended Problem: If a coach wanted to count how many different ways his players could be placed into positions for a sport, he might use permutations or combinations. Name three sports for which a coach would use permutations and three sports for which a coach would use combinations.
47. A commuter airline flies planes that have 4 first class seats and 20 coach seats. Because many people that make reservations on their flights don't show up, the airline will take more reservations for a flight than it has seats. Suppose the airline has made 23 reservations for coach seats and 6 reservations for first class seats and that the airline does not assign seats when reservations are made.
- How many different sets of exactly 20 of the 23 people with reservations for coach seats are possible? Explain your choice of permutations or combinations.
 - How many different sets of more than 20 of the 23 people with coach reservations are possible? Explain. Why would the airline be concerned about these sets?
 - How many different sets that contain exactly the correct number of both first class passengers and coach passengers are there? Explain.
 - The airline's biggest concern is that the total number of people that show up is greater than the total number of seats. How many different sets of passengers with reservation contain more than the number of seats available on the flight? Explain.
48. Will ${}_nC_r$ always have the same value as ${}_nC_{n-r}$? Explain using an example. Will ${}_nP_r$ always have the same value as ${}_nP_{n-r}$? Explain.

- _____ 49. Ten balls numbered from 1 to 10 are placed in an urn. If one ball is selected at random, find the probability that it is number 5.
- a. $\frac{9}{10}$ b. $\frac{4}{5}$ c. $\frac{1}{2}$ d. $\frac{1}{10}$
50. A number cube with faces numbered 1, 2, 3, 4, 5, and 6 is rolled. Find the probability of rolling a number less than 7.
- _____ 51. A single standard six-sided die is rolled. Find the probability of rolling the number 3.
- a. $\frac{2}{3}$ c. $\frac{1}{6}$
b. $\frac{1}{2}$ d. 1
52. A six-sided die is rolled 60 times. Six comes up 13 times.
- a. What is the theoretical probability of rolling a six?
b. What is the experimental probability of rolling a six?
- _____ 53. A number cube is rolled 370 times and the results recorded as follows: there were 64 ones, 69 twos, 58 threes, 67 fours, 66 fives, and 46 sixes. What is the experimental probability of rolling an even number?
- a. 0.41 b. 0.49 c. 0.51 d. 0.59
54. a. Describe an event that has a probability of 0.
b. Describe an event that has a probability of 1.
55. Five friends play a game. Each person writes his or her name on a piece of paper, and the papers are randomly redistributed. Find the probability that each person gets back his or her own name.
- _____ 56. In a class of 25 students, 18 have brown eyes. If two students are chosen at random, which expression will calculate the probability that both have brown eyes?
- a. $\frac{{}^{18}P_2}{{}^{25}P_2}$ b. $\frac{{}^7C_2}{{}^{18}C_2}$ c. $\frac{{}^{18}C_2}{{}^{25}C_2}$ d. $\frac{{}^7C_2}{{}^{25}C_2}$
- _____ 57. A jar contains 10 blue marbles, 4 red marbles, and 8 white marbles. What are the odds of drawing a blue marble from the bag?
- a. $\frac{5}{11}$ b. $\frac{5}{6}$ c. $\frac{11}{5}$ d. $\frac{6}{5}$
- _____ 58. A spinner has five equal portions colored orange, red, blue, yellow, and green. What are the odds against spinning a red or an orange?
- a. $\frac{2}{3}$ b. $\frac{3}{2}$ c. $\frac{5}{2}$ d. $\frac{2}{5}$
- _____ 59. There are 20 beads in a bag, of which 8 beads are white, 2 beads are yellow, 6 beads are green, and the rest are blue. Janina will choose one bead from the bag without looking. What are the odds in favor of choosing a white bead?
- a. 5 to 2 b. 2 to 3 c. 3 to 2 d. 1 to 1

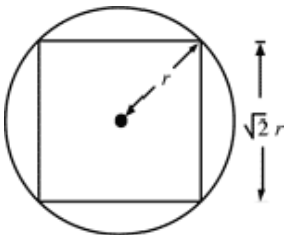
60. A bag contains seven green marbles and one red marble. The marbles are randomly selected one at a time. What are the odds in favor of picking the red marble?
61. Project: Design an experiment to find the probability of some real-world event. Use an event that has no theoretical probability. Describe your experiment and its results.
62. Find the probability that a randomly thrown dart will hit the shaded region. Assume that all three interior triangles are congruent and that the dart is equally likely to hit any point inside the triangle.



Half of a circle is inside a square and half is outside, as shown.



63. If a point is selected at random inside the square, find the probability that the point is also inside the circle.
64. If a point is selected at random inside the square, find the probability that the point is not inside the circle.
65. A square is inscribed inside a circle as shown. If a point is chosen at random inside the circle, find the probability that the point is also inside the square.



66. Open-ended Problem: A high school basketball player shoots free throws with 75% accuracy. Design an experiment that models this player's accuracy.

67. In a poll of a randomly selected sample of likely voters, 240 voters prefer Candidate A, 350 prefer Candidate B, and 210 prefer Candidate C.
- According to the poll, what is the probability that a randomly selected likely voter favors Candidate A?
 - Is your answer in part (a). an experimental probability or a theoretical probability? Explain.
 - What are the odds in favor of a randomly selected likely voter being in favor of Candidate B? What are the odds against a randomly selected likely voter being in favor of Candidate B?
 - If your answers to part (c) are written as fractions, how are they related? Would this still be true if a different number of people favored Candidate B? Explain.
68. Find the probability $P(4 \text{ or } 3)$ when a fair die is rolled.
69. Four cards are randomly selected from a standard 52-card deck. What is the probability of getting 4 hearts or 4 numbers less than 6 (count aces as 1)?
- _____ 70. Two cards are randomly selected from a standard 52-card deck. What is the probability of getting 2 hearts or 2 numbers less than 8 (count aces as 1)?
- a. 0.344 b. 0.385 c. 0.328 d. 0.003
71. A bag contains 7 red balls numbered 1, 2, 4, 5, 6, 7, 10 and 3 white balls numbered 3, 8, 9. If a ball is drawn at random, what is the probability the ball is
- red or odd-numbered
 - white or even-numbered?
72. A bag contains 6 red balls numbered 1, 2, 4, 5, 8, 9 and 4 white balls numbered 3, 6, 7, 10. If a ball is drawn at random, what is the probability the ball is
- red or odd-numbered
 - white or even-numbered?
73. Of 100 students, 23 are taking Calculus, 29 are taking French, and 12 are taking both Calculus and French. If a student is picked at random, what is the probability that the student is taking Calculus or French?
74. A and B are two events. $P(A) = 0.71$; $P(B) = 0.36$; $P(A \text{ and } B) = 0.23$. Find the probability of A or B .
75. A and B are two events. $P(A) = 0.08$; $P(B) = 0.25$; $P(A \text{ and } B) = 0.12$. Find the probability of A or B .
76. A and B are two events. $P(A) = 0.54$; $P(B) = 0.42$; $P(A \text{ or } B) = 0.85$. Find the probability of A and B .
77. A bag contains 6 red balls numbered 1, 2, 5, 6, 8, 9 and 4 white balls numbered 3, 4, 7, 10. If a ball is drawn at random, what is the probability the ball is
- red and odd-numbered
 - white and even-numbered?
78. If you draw one card at random from a deck of 15 cards numbered 1 through 15, inclusive, what is the probability that the number you draw is divisible by 7 and even?

79. The probability for snow today is 0.6. The probability for snow tomorrow is 0.4. The probability for snow both days is 0.1. Find the probability that it will snow at least one of the two days.
80. The probability for snow today is 0.4. The probability for snow tomorrow is 0.35. The probability for snow both days is 0.17. Find the probability that it will snow at least one of the two days.
81. The probability for snow today is 0.48. The probability for snow tomorrow is 0.27. The probability for snow both days is 0.15. Find the probability that it will snow at least one of the two days.

You spin a spinner divided into eight equal parts numbered 1 through 8. Tell whether the events are *disjoint* or *overlapping*. Then find $P(A \text{ or } B)$.

82. **Event A:** Spinner stops on an even number.
Event B: Spinner stops on a multiple of 3.
83. **Event A:** Spinner stops on an odd number less than 3.
Event B: Spinner stops on an even number greater than 4.
84. A card is drawn at random from a standard deck of playing cards. Find the probability that it is not a face card (**J**, **Q**, or **K**).
85. A card is drawn at random from a standard deck of playing cards. Find the probability that it is not an ace or a heart.
86. A card is drawn at random from a standard deck of playing cards. Find the probability that it is not a face card (**J**, **Q**, or **K**) or an ace.
87. If $P(A) = 0.72$, what is $P(\bar{A})$?
88. If $P(A) = 0.47$, what is $P(\bar{A})$?
89. If $P(A) = 0.87$, what is $P(\bar{A})$?
90. Six balls numbered from 1 to 6 are placed in an urn. One ball is selected at random. Find the probability that it is NOT number 3.
- _____ 91. Eight balls numbered from 1 to 8 are placed in an urn. One ball is selected at random. Find the probability that it is NOT number 2.
- a. $\frac{7}{8}$ b. $\frac{1}{2}$ c. $\frac{3}{4}$ d. $\frac{1}{8}$

92. The distribution of students in an Algebra class is shown in this table.

	Sophomores	Juniors	Seniors
Boys	3	6	5
Girls	2	8	2

The teacher places slips of paper with the student's names on them in a bag. When the teacher needs a "volunteer" the teacher randomly selects a name from the bag. Let A be the event that the student chosen is a girl and B be the event that the student chosen is a senior.

a. If one student from this class is randomly selected, find $P(\overline{A})$. Explain your answer.

b. Are A and B disjoint events? Explain.

c. Find the probability that a randomly selected student from this class is either a girl or a senior.

d. Find $P(\overline{A} \text{ or } B)$.

e. Can you determine the probability that the randomly chosen student is a sophomore or junior or not a boy? Explain.

93. School administrators report that 40% of the students at their school have part time jobs and 70% of the students at their school participate in extracurricular activities.

a. Let A be the event that a student has a part time job and B be the event that a student participates in extracurricular activities. For the students at this school are A and B disjoint events? Explain.

b. What does your answer to part (a) mean for the students at this school?

c. Suppose 83% of the students at this school either have a part time job or participate in extracurricular activities. What percent of the students at this school have part time jobs and participate in extracurricular activities? Explain.

94. A drawer contains 10 red socks, 6 white socks, and 8 blue socks. Without looking, you draw out a sock, return it, and draw out a second sock. What is the probability that the first sock is blue and the second sock is white?

- _____ 95. Two urns each contain green balls and black balls. Urn I contains four green balls and six black balls and Urn II contains five green balls and three black balls. A ball is drawn from each urn at random. What is the probability that both balls are black?

a. $\frac{9}{83}$

b. $\frac{20}{81}$

c. $\frac{9}{82}$

d. $\frac{9}{40}$

- _____ 96. A coin is tossed and a die is rolled. What is the probability that the coin shows tails and the die shows 2?

a. $\frac{5}{6}$

c. $\frac{1}{12}$

b. $\frac{1}{3}$

d. $\frac{1}{6}$

97. A and B are independent events.

$P(A) = 0.6$ and $P(B) = 0.8$, find $P(A \text{ and } B)$.

98. A and B are independent events.

$P(A) = 0.7$ and $P(B) = 0.32$, find $P(A \text{ and } B)$.

99. A and B are independent events.
 $P(A) = \frac{3}{5}$ and $P(B) = \frac{5}{6}$, find $P(A \text{ and } B)$.

A jar contains 21 green marbles and 30 yellow marbles. One marble is drawn at random and the color noted. It is then returned to the jar, mixed in, and another marble is drawn at random.

100. Find the probability that both marbles are green.
101. Find the probability that both marbles are yellow.
102. Find the probability that one marble of each color is obtained.
103. If a student tosses a penny, a nickel, a dime, and a quarter, what is the probability of returning a penny head, a nickel tail, a dime head, and a quarter head?
- _____ 104. You work at a T-shirt printing business. 7% of 1300 T-shirts shipped are printed improperly. If you randomly select 100 T-shirts (selecting a T-shirt and replacing it), what is the probability that at least one of them is printed improperly?
- | | |
|----------|----------|
| a. 0.501 | c. 0.999 |
| b. 0.001 | d. 0.901 |
- _____ 105. A bag contains 6 orange, 7 green, and 8 yellow marbles. Find the probability of picking 3 yellow marbles if each marble is returned to the bag before the next marble is picked.
- | | |
|-----------------------|---------------------|
| a. $\frac{512}{9261}$ | c. $\frac{1}{9261}$ |
| b. $\frac{1}{7980}$ | d. $\frac{4}{95}$ |
- _____ 106. A bag contains 3 red marbles and 5 purple marbles. One marble is drawn at random and not replaced. Then a second marble is drawn at random. What is the probability that the first marble is purple and the second one is red?
- | | |
|------------------|--------------------|
| a. $\frac{8}{5}$ | c. $\frac{15}{56}$ |
| b. $\frac{5}{8}$ | d. $\frac{15}{64}$ |
- _____ 107. A drawer contains 6 red socks, 5 white socks, and 9 blue socks. Without looking, you draw out a sock and then draw out a second sock without returning the first sock. What is the probability that the first sock and the second sock are both red?
- | | |
|---------------------|--------------------|
| a. $\frac{3}{38}$ | c. $\frac{9}{100}$ |
| b. $\frac{81}{400}$ | d. $\frac{18}{95}$ |

108. Open-ended: Make up an experiment involving 10 marbles of two different colors in which 2 marbles are drawn at random from a jar without replacement. Draw a probability tree diagram showing the possible outcomes at each stage of the experiment and the probabilities of these outcomes.
- _____ 109. Which of these pairs of events are dependent?
- You flip a coin and get tails. You flip it a second time and get heads.
 - You pull your friend's name out of a hat that holds 20 different names, replace the name, then draw out your friend's name again.
 - You spin a spinner divided into five equal parts and is numbered 1-5. You get a 3 on the first spin, and then spin again and get a 2 on the second spin.
 - You remove a black sock from a drawer without looking, then remove another black sock.
- _____ 110. Which of these pairs of events are independent?
- You remove a blue glove from a drawer without looking, then remove another blue glove.
 - You reach into a basket and draw a name for a prize, return the name into the basket, and then draw a second time for another prize.
 - Your CD player has a random mode that chooses songs randomly and plays each song once before repeating. While listening to the CD player in random mode, you hear track 5 first and then hear track 3 second.
 - You choose a member of the basketball team to be the center. You choose a different member to be a forward.

Tell whether the events are *independent* or *dependent*. Then answer the question.

111. Two urns both contain red balls and white balls. Urn I contains 3 red balls and 3 white balls, and Urn II contains 5 red balls and 2 white balls. A ball is drawn from each urn. What is the probability that both balls are white?
112. A drawer contains 9 black socks, 8 gray socks, and 7 blue socks. Without looking, you draw out a sock and then draw out a second sock without returning the first sock. What is the probability that the two socks you draw are the same color?
113. A laundry bag contains 4 brown socks and 7 black socks. Find the probability of picking a brown sock first, followed by a black sock, if the first sock is NOT returned to the bag before the second sock is picked.
114. A bag contains 8 yellow, 9 white, and 7 red marbles. Find the probability of picking 3 yellow marbles if each marble is NOT returned to the bag before the next marble is picked.

115. The cars on a dealer's lot are distributed as follows.

	Full Size	Mid-Size	Compact	Sub-Compact
American	12	18	15	5
Japanese	9	21	12	6
European	8	12	6	4

For a single car chosen at random from the cars on this dealer's lot, let A be the event that the car chosen is American and B be the event that the car chosen is compact.

- For a single car selected from this dealer's lot, find $P(A)$ and $P(A|B)$. Explain your answers.
 - Are A and B independent events? Explain.
 - Estimate the probability that the next three cars sold from this lot are compact American cars?
 - Are the sales in part (c) independent or dependent events? Explain.
 - Given A is the event that the car chosen is American, give an example of an independent event C .
116. Your school cafeteria offers three entrees for lunch each day. The three entrees are randomly selected from a menu of 20 entrees. Your favorite entree is grilled cheese. What is the probability the cafeteria will serve grilled cheese at least once during the week (5 days)?
117. A company with a total of 75 employees has 7 managers. All of the company employees attend the company picnic where 3 trips are awarded. To choose the winners of the trips, all the employee's names are written on cards and placed in a punch bowl.
- If the names of the winners are replaced, what is the probability that all 3 trips are won by managers? Are the selections of the winners dependent or independent? Explain.
 - If the names of the winners are not replaced, what is the probability that all 3 trips are won by non-managers? Are the selections of the winners dependent or independent? Explain.
118. Complete this chart for finding the number of ways of getting heads when tossing five coins.

Ways of Getting Heads When Tossing Five Coins							
Number of Heads	0	1	2	3	4	5	Total
Number of Outcomes							32
Probability							$\frac{32}{32} = 1$

119. A company guarantees customer satisfaction on the purchase of a product, or the company will refund the purchase price of the product. Previous experience has shown that 9% of the purchases are returned. What is the probability that no more than 1 of the next 7 purchases will be returned?
120. A fair coin is tossed 16 times. What is the probability of obtaining heads exactly once? Express the answer both in terms of ${}_nC_k$ and as a four-place decimal.
121. The probability that Big Co will hire new graduates from State U. who have interviews in any given year is 70%. Of the graduates this year, 7 were chosen at random for interviews. What is the probability that exactly 5 of this select group will be hired?

122. Find the probability of getting exactly five tails when nine coins are tossed.

Open-ended:

123. Create a situation, including data, that demonstrates a skewed distribution.

Writing:

124. List the four characteristics of a binomial experiment.

125. Let X be a random variable that represents the difference when two six-sided number cubes are rolled. Make a table and a histogram showing the probability distribution for X .

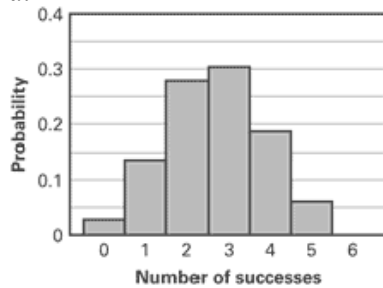
126. The histograms show binomial distributions with different probabilities of exactly k successes in 6 trials. Match the histogram with the appropriate probability.

1. $p = 0.1$

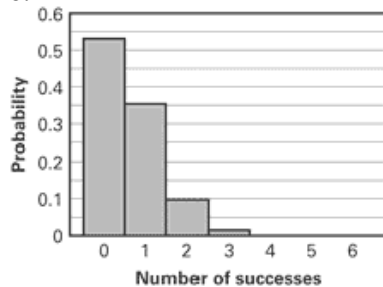
2. $p = 0.45$

3. $p = 0.8$

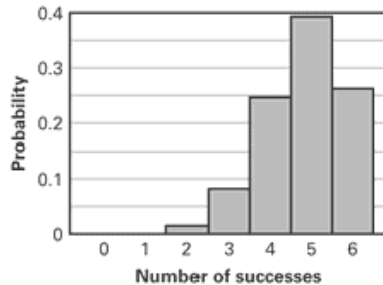
a.



b.

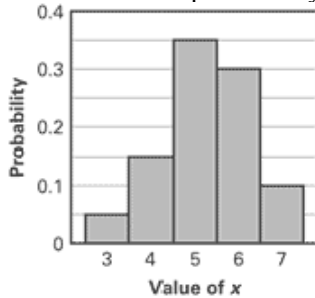


c.



127. Use the histogram of a probability distribution for a random variable x .

- What is the probability x will equal 6?
- What is the least likely value of x ?
- What is the probability that x is even?



128. Identify the outlier in the data set. Then find the mean, median, mode(s), range and standard deviation when the outlier is included and when it is not. Round the mean, median, and standard deviation to the nearest tenth if necessary.

33, 35, 37, 37, 39, 59

____ 129. Find the median of the set of numbers.

17, 37, 39, 27, 38, 26, 28, 24, 40

- | | |
|---------|---------|
| a. 27.2 | c. 30.7 |
| b. 23 | d. 28 |

____ 130. Find the mode of the set of data.

17, 11, 11, 13, 15, 15, 17, 13, 11, 14

- | | |
|---------|---------|
| a. 13.7 | c. 11 |
| b. 12 | d. 13.5 |

131. Mike was in charge of collecting contributions for the Food Bank. He received contributions of \$20, \$100, \$30, \$20, and \$60.

Find the following:

mean (average)

median

mode

range

132. The data below represent the price of a shirt at ten stores. Find the *mean*, *median*, and *mode* of the data.
48, 33, 29, 52, 37, 44, 29, 35, 44, 29

133. The data below represent the price of a pair of shoes at ten stores. Find the *mean*, *median*, and *mode* of the data.

77, 65, 59, 77, 63, 60, 60, 61, 68, 77

134. The data below represent the price of a dress at ten stores. Find the *mean*, *median*, and *mode* of the data.

85, 99, 90, 98, 90, 86, 93, 95, 87, 96

144. Here are the points scored by the Culver Eagles in their basketball games this year.

Home: 86, 81, 78, 94, 80, 69, 82, 49, 93, 87, 90

Away: 71, 65, 57, 84, 69, 67, 59, 72, 58, 64, 68

- Find the mean, median, range, and standard deviation for the points scored during the Eagles' home games this year.
 - Find the mean, median, range, and standard deviation for the points scored during the Eagles' away games this year.
 - Compare the statistics for home and away games. What can you conclude?
 - Delete the 49 from the home games and recalculate the values in part (a). Do your conclusions from part (c) change? Explain.
145. The mean age of the employees at a company is 40. The standard deviation of the ages is 3. Suppose the same people were working for the company 5 years ago. What were the mean and the standard deviation of their ages then?

Writing:

146. Explain what happens to the mean, the median, the range, and the standard deviation when the same constant value is added to each value in a data set.
147. The table below shows the price of a round trip ticket to and from your vacation destination on five different airlines.

Airline A	\$307
Airline B	\$291
Airline C	\$300
Airline D	\$288
Airline E	\$268

- Find the mean and median of the ticket prices.
- Find the range and standard deviation of the ticket prices.
- 10% sales tax is added to the price of each ticket. Use what you know about multiplying each value in a data set by a constant to find the mean, median, range, and standard deviation of the total costs of the tickets.

148. The table below shows the price of an individual pizza at five different airports.

Chicago (O°Hare)	\$4.02
San Francisco	\$4.96
New York (JFK)	\$6.30
Los Angeles	\$5.82
Denver	\$4.67

- Find the mean and median of the pizza prices.
 - Find the range and standard deviation of the pizza prices.
 - 10% sales tax is added to the price of each pizza. Use what you know about multiplying each value in a data set by a constant to find the mean, median, range, and standard deviation of the total costs of the pizzas.
149. At an electronics store, the median price of a stereo system is \$50. The range of prices is \$350. During a sale, every stereo system is discounted 3%. Find the median and the range of the discounted prices of the stereo systems.

Writing:

150. Explain what happens when each value in a data set is multiplied by the same positive constant.
151. The monthly rents for the apartments in a building are listed below.
\$425, \$550, \$550, \$550, \$650, \$650, \$650, \$650, \$800, \$900
- Find the mean, median, mode, range, and standard deviation of the rents.
 - The apartment manager considers raising the rent for every apartment by \$50. Find the mean, median, mode, range, and standard deviation of the rents after they are raised by \$50. Explain your reasoning.
 - The apartment manager then decides to raise the rent for every apartment by 10% instead of raising each rent by \$50. Find the mean, median, mode, range, and standard deviation of the rents after they are raised by 10%. Compare these with the values calculated in part (b). Explain any differences.
152. Last year, the personal best high jumps of track athletes in a nearby state were normally distributed with a mean of 221 cm and a standard deviation of 11 cm. What is the probability that a randomly selected high jumper has a personal best between 199 and 210 cm?
153. Open-ended Problem: Describe several sets of real data that might have a normal distribution.
154. The duration of routine operations in a certain hospital has approximately a normal distribution with an average of 125 minutes and a standard deviation of 15 minutes. What percentage of operations last longer than 155 minutes?

155. Suppose the test scores on an exam show a normal distribution with a mean of 82 and a standard deviation of 5.
- Within what range do about 95% of the scores fall?
 - About what percent of the scores are between 77 and 92?
- _____ 156. The class average on a math test was 82 and the standard deviation was 5.4. Find the z -score for a test score of 70.
- ≈ -2.22
 - ≈ -12.96
 - ≈ 12.96
 - ≈ 2.22
157. Sam's score on a test was 66. Jane's score on the same test was 88. The class average was 78, and the standard deviation was 3.4.
- Find Sam's z -score.
 - Find Jane's z -score.
158. The class average on a test was 85, with a standard deviation of 3.8. Find the probability that a student received at least a 76 on the test.

Writing:

159. Describe a normal distribution. Explain the 68-95-99.7 rule.
160. During boot camp, the drill sergeant measured the weight of the men in his unit. He found the average weight of the men to be 142 pounds and the standard deviation 14 pounds. The data is normally distributed. Find the interval in which 68% of the data lies. What is the probability that a man picked at random from the unit will weigh more than 170 pounds? that he will weigh less than 128 pounds?

Match the sample of students with the correct sampling method.

- _____ 161. every seventh student on the class list
- random
 - self - selected
 - systematic
 - convenience
- _____ 162. mail a response card
- random
 - systematic
 - self - selected
 - convenience
- _____ 163. the first 40 students who enter the office
- random
 - systematic
 - self - selected
 - convenience
- _____ 164. At Rosa's summer job with a research company, she must get a representative sample of people from her town to answer a question about health habits. Which of the following methods could be used to get a representative sample?
- selecting people who are in the hospital
 - gathering responses from women who own businesses in town
 - selecting people randomly from a computer list
 - selecting every 10th person as they enter a fast-food restaurant

165. Suppose you wanted to find out how many students at your school have a job. Identify the sampling method used in the following situation.
You ask the person farthest from the door in each 7th period classroom.
- An investor would like to purchase a major league baseball team and wants to find out if people in his city will support higher taxes to build a new stadium. The investor considers several sampling methods. Tell whether the sample is biased or representative.**
166. Survey people as they exit the local baseball stadium.
167. A restaurant owner wants to find out how often people go out for dinner. He surveys 50 people as they leave the restaurant. Is the sample representative or biased? Explain.
168. When 900 voters were polled, 53% said they were voting *yes* on an initiative measure. Find the margin of error and the interval that is likely to contain the true population percent.
169. Maria read in the newspaper that 59% of voters in her city were voting "no" on a local initiative measure. The newspaper article stated that 772 people were originally polled. What is the margin of error for the survey? Find the interval that is likely to contain the true population percent.
170. According to a recent survey, 45% of American teenagers in a random sample said they prefer thick crust pizza to thin crust. If the margin of error is $\pm 6\%$, about how many students were surveyed?
171. Identify the type of sample and describe the population of the survey. Then tell if the sample is potentially biased. Explain your reasoning.
A telemarketer calls every tenth number in a phone book.
172. Identify the type of sample and describe the population of the survey. Then tell if the sample is potentially biased. Explain your reasoning.
The first 50 students to arrive at school are surveyed.
173. Each year the junior class goes on a field trip. You want to poll the class to find out where they would like to go. There are 141 students in the junior class. Describe a method for selecting a random sample of 20 juniors.
174. Open-ended Problem: List several factors that may bias a survey conducted in each manner.
- calling people on the telephone
 - printing the survey in a magazine
 - using a call-in number during a television show
 - asking students directly during homeroom in school
175. In a survey of 1600 voters, 51% said they voted for candidate A.
- What is the margin of error for the survey?
 - Give an interval that is likely to contain the exact percent of all voters who voted for candidate A.

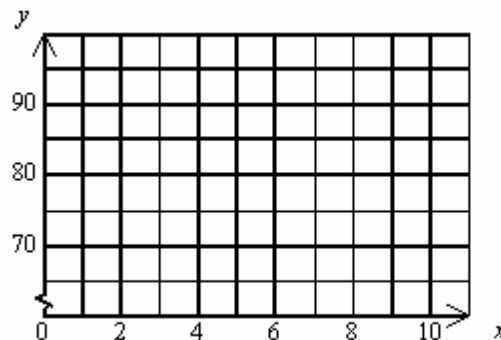
176. Use examples to discuss the difference between self-selected samples, systematic samples, random samples, and convenience samples. Consider the differences within the context of a school survey.
177. A local radio station surveyed a random sample of 1800 people. Of the people surveyed, 44% of the 1800 respondents stated that they prefer Jones over Davis in the city council race and 37% of the 1800 respondents stated they prefer Davis over Jones. Can you predict the winner based on the information from the survey? Explain.
178. Election results are often predicted before the final ballot counts are known by taking voting results from a random sample of voters exiting a polling place. Suppose in a two-candidate election, 118 out of 210 exiting voters (about 56.2%) said they voted for candidate A, while the other exiting voters said they voted for candidate B. Can you determine whether candidate A or B will win the election? Explain.

179.

Winning Zucchini Lengths - State Fair										
Year	86	87	88	89	90	91	92	93	94	95
Length (in.)	30.4	31.1	32.5	33.0	33.9	34.6	35.2	35.0	36.4	36.4

- a. Make a scatter plot of the ten data points. Let x represent the number of years after 1985 and y represent the winning length that year.
- b. Use technology to perform a linear regression. What is the equation of the linear regression model? Graph the equation on the scatter plot for part (a).
- c. Predict the winning length for the year 2000.
180. This year the Wolverine basketball team scored the following number of points in its 10 games.
- | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|
| Game | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Points | 74 | 74 | 84 | 82 | 78 | 86 | 87 | 93 | 87 | 93 |

- a. Make a scatter plot of the ten data points. Let x = the game number and y = the number of points scored during the game.
- b. Find an equation for a line of fit. Graph the line on the scatter plot in part (a). Label the line.



Name: _____

ID: A

187.

x	0	10	20	30	40	50
y	55	30	20	15	6	2

188.

x	2	8	14	20	26	32
y	525	600	700	830	950	1110

189.

x	13	14	15	16	17	18
y	17.8	27.1	29.5	27.9	18.2	2.8

190.

x	2	4	6	8	10	12	14
y	63	45	38	33	31	32	39

191.

x	0	1	2	3	4	5
y	149.9	224.2	335.5	510.3	760.3	1142.1

192.

x	3	6	9	12	15	18	21
y	240	150	96	55	32	21	15

Unit 5 & 6 Review - Probability and Data Answer Section

1. ANS:
36

PTS: 1 DIF: Level A REF: MAL21391 NAT: NCTM 9-12.NOP.2.c
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: event | probability BLM: Knowledge NOT: 978-0-618-65615-8

2. ANS:
336

PTS: 1 DIF: Level A REF: MAL21392 NAT: NCTM 9-12.NOP.2.c
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: probability | event BLM: Knowledge NOT: 978-0-618-65615-8

3. ANS: A PTS: 1 DIF: Level B REF: MAL21394
NAT: NCTM 9-12.NOP.2.c

TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: fundamental counting principle BLM: Application NOT: 978-0-618-65615-8

4. ANS:

Sample answer: Using the names Coriat and Susana, there are 720 different permutations of Coriat and 180 different permutations of Susana.

PTS: 1 DIF: Level B REF: MAL21396 NAT: NCTM 9-12.DAP.4.e
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: permutations BLM: Application NOT: 978-0-618-65615-8

5. ANS:

Sample answer: Using the words amnesty and maximum, there are 5040 different permutations of amnesty and 840 different permutations of maximum.

PTS: 1 DIF: Level B REF: MAL21397 NAT: NCTM 9-12.DAP.4.e
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: permutations BLM: Application NOT: 978-0-618-65615-8

6. ANS:
720

PTS: 1 DIF: Level B REF: MAL21398 NAT: NCTM 9-12.NOP.2.c
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: permutations BLM: Application NOT: 978-0-618-65615-8

7. ANS:
1

PTS: 1 DIF: Level A REF: MAL21399
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: factorial | evaluate BLM: Knowledge NOT: 978-0-618-65615-8

8. ANS:
3,628,800

PTS: 1 DIF: Level A REF: MAL21400
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: evaluate | factorial BLM: Knowledge NOT: 978-0-618-65615-8

9. ANS: B PTS: 1 DIF: Level B REF: MAL21401
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: factorial | evaluate | divide BLM: Comprehension
NOT: 978-0-618-65615-8

10. ANS: B PTS: 1 DIF: Level B REF: MAL21402
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: evaluate | divide | multiply | factorial BLM: Comprehension
NOT: 978-0-618-65615-8

11. ANS: A PTS: 1 DIF: Level B REF: MAL21405
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: permutations BLM: Application NOT: 978-0-618-65615-8

12. ANS:
$$\frac{11!}{(11-2)!}$$

PTS: 1 DIF: Level A REF: MAL21406
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: permutation | n objects taken r at a time BLM: Knowledge
NOT: 978-0-618-65615-8

13. ANS:
60

PTS: 1 DIF: Level B REF: MAL21407
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: permutation | n objects taken r at a time BLM: Knowledge
NOT: 978-0-618-65615-8

14. ANS: D PTS: 1 DIF: Level B REF: MAL21408
NAT: NCTM 9-12.NOP.2.c
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: permutations BLM: Comprehension
NOT: 978-0-618-65615-8

15. ANS:
5! = 120

PTS: 1 DIF: Level B REF: MAL21409 NAT: NCTM 9-12.NOP.2.c
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: permutation BLM: Comprehension NOT: 978-0-618-65615-8

16. ANS:
 $6! = 720$

PTS: 1 DIF: Level B REF: MAL21410 NAT: NCTM 9-12.NOP.2.c
 TOP: Lesson 10.1 Apply the Counting Principle and Permutations
 KEY: permutation BLM: Comprehension NOT: 978-0-618-65615-8

17. ANS:
 $\frac{5!}{2} = 60$

PTS: 1 DIF: Level C REF: MAL21411 NAT: NCTM 9-12.NOP.2.c
 TOP: Lesson 10.1 Apply the Counting Principle and Permutations
 KEY: permutation BLM: Comprehension NOT: 978-0-618-65615-8

18. ANS:
 70

PTS: 1 DIF: Level C REF: MAL21412 NAT: NCTM 9-12.NOP.2.c
 TOP: Lesson 10.1 Apply the Counting Principle and Permutations
 KEY: permutations BLM: Comprehension
 NOT: 978-0-618-65615-8

19. ANS:
 70

PTS: 1 DIF: Level C REF: MAL21413 NAT: NCTM 9-12.NOP.2.c
 TOP: Lesson 10.1 Apply the Counting Principle and Permutations
 KEY: permutations BLM: Comprehension
 NOT: 978-0-618-65615-8

20. ANS:

a. $8! = 40,320$

b. ${}_{12}P_8$; There are more ways the finalists can be seated if there are 12 buzzers because there are 12 possible places the first finalist can be seated instead of 8. So, the number of different ways to seat the 8 finalists at 12 buzzers is $12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 = \frac{12!}{4!}$ while the number of ways the finalists can be seated at 8 buzzers is $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 8!$.

c. $\frac{8!}{3!4!} = 280$; Since there are 3 prizes of \$200 and 4 prizes of \$100, the permutations of these repeated values must be divided out.

PTS: 1 DIF: Level B REF: A2.10.01.ER.01
 NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.NOP.2.c
 TOP: Lesson 10.1 Apply the Counting Principle and Permutations
 KEY: Permutation | extended response | real-life BLM: Application
 NOT: 978-0-618-65615-8

21. ANS:
24

PTS: 1 DIF: Level B REF: MAL21423
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: fundamental counting principle BLM: Application NOT: 978-0-618-65615-8

22. ANS: A PTS: 1 DIF: Level A REF: MAL21424
TOP: Lesson 10.1 Apply the Counting Principle and Permutations
KEY: fundamental counting principle BLM: Application NOT: 978-0-618-65615-8

23. ANS:
$$\frac{6!}{(6-2)! \cdot 2!}$$

PTS: 1 DIF: Level A REF: MAL21414 NAT: NCTM 9-12.DAP.4.e
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: combinations BLM: Knowledge NOT: 978-0-618-65615-8

24. ANS:
45

PTS: 1 DIF: Level B REF: MAL21415 NAT: NCTM 9-12.DAP.4.e
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: combinations BLM: Comprehension
NOT: 978-0-618-65615-8

25. ANS:
7

PTS: 1 DIF: Level B REF: MAL21416 NAT: NCTM 9-12.DAP.4.e
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: combinations BLM: Application NOT: 978-0-618-65615-8

26. ANS: B PTS: 1 DIF: Level B REF: MAL21417
NAT: NCTM 9-12.DAP.4.e
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: combinations BLM: Application NOT: 978-0-618-65615-8

27. ANS: C PTS: 1 DIF: Level B REF: MAL21418
NAT: NCTM 9-12.DAP.4.e
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: combinations BLM: Application NOT: 978-0-618-65615-8

28. ANS: D PTS: 1 DIF: Level B REF: MAL21419
NAT: NCTM 9-12.DAP.4.e
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: combinations BLM: Application NOT: 978-0-618-65615-8

29. ANS:
1365

PTS: 1 DIF: Level B REF: MAL21420
NAT: NCTM 9-12.NOP.2.c | NCTM 9-12.DAP.4.e
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: possible | different | random | combinations BLM: Application
NOT: 978-0-618-65615-8

30. ANS:
1820

PTS: 1 DIF: Level B REF: MAL21421
NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.NOP.2.c
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: different | random | possible | combinations BLM: Application
NOT: 978-0-618-65615-8

31. ANS:
22,100

PTS: 1 DIF: Level A REF: MAL21422
NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.NOP.2.c
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: combinations BLM: Application NOT: 978-0-618-65615-8

32. ANS:
60

PTS: 1 DIF: Level B REF: MAL21425
NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.NOP.2.c
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: combinations BLM: Application NOT: 978-0-618-65615-8

33. ANS:

$$1 \quad 3 \quad 3 \quad 1;$$

$$x^3 + 3x^2y + 3xy^2 + y^3$$

PTS: 1 DIF: Level B REF: MAL21430
NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.NOP.2.c
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: Pascal's triangle BLM: Comprehension
NOT: 978-0-618-65615-8

34. ANS:

$$1 \quad 1;$$

$$a - b$$

PTS: 1 DIF: Level B REF: MAL21431
NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.NOP.2.c
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: Pascal's triangle BLM: Comprehension
NOT: 978-0-618-65615-8

35. ANS:

Sample answer: This question involves the number of ways to select 1 of 4 given items. This is the combination ${}_4C_1$. The value of ${}_4C_1$ can be found in Pascal's triangle as the entry in row 4, diagonal 1, which is 4.

PTS: 1

DIF: Level B

REF: MAL21432

NAT: NCTM 9-12.NOP.2.c | NCTM 9-12.REP.1 | NCTM 9-12.COM.1 | NCTM 9-12.COM.2

TOP: Lesson 10.2 Use Combinations and the Binomial Theorem

KEY: Pascal's triangle | word | combination

BLM: Analysis

NOT: 978-0-618-65615-8

36. ANS:

Sample answer: The pattern of coefficients comes from Pascal's triangle: 1 6 15 20 15 6 1. The pattern of the exponents of the variable a involves decreasing the value of its exponent by 1 for each term, beginning with 6 and ending with 0. The pattern of the exponents of the variable b involves increasing the value of its exponents by 1 for each term, beginning with 0 and ending with 6. The expanded form is $a^6 + 6a^5b + 15a^4b^2 + 20a^3b^3 + 15a^2b^4 + 6ab^5 + b^6$.

PTS: 1

DIF: Level B

REF: MAL21443

NAT: NCTM 9-12.GEO.4.3 | NCTM 9-12.DAP.4.e | NCTM 9-12.PRS.4 | NCTM 9-12.COM.2

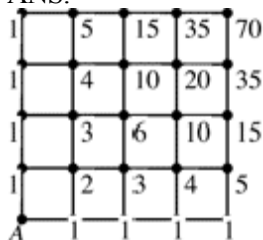
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem

KEY: binomial | multiply | Pascal's triangle

BLM: Analysis

NOT: 978-0-618-65615-8

37. ANS:



If you rotate the figure 135° clockwise (which places A at the top), the numbers can be seen to be those from the top of Pascal's triangle.

PTS: 1

DIF: Level C

REF: MAL21433

TOP: Lesson 10.2 Use Combinations and the Binomial Theorem

KEY: Pascal's triangle | grid

BLM: Analysis

NOT: 978-0-618-65615-8

38. ANS:

$$q^3 + 9q^2r + 27qr^2 + 27r^3$$

PTS: 1

DIF: Level B

REF: MAL21434

NAT: NCTM 9-12.DAP 4.e | NCTM 9-12.NOP.2.c

TOP: Lesson 10.2 Use Combinations and the Binomial Theorem

KEY: combinations | binomial theorem | expansion

BLM: Comprehension

NOT: 978-0-618-65615-8

39. ANS: A PTS: 1 DIF: Level B REF: MAL21435

NAT: NCTM 9-12.NOP.2.c | NCTM 9-12.DAP.4.e

TOP: Lesson 10.2 Use Combinations and the Binomial Theorem

KEY: binomial theorem | expand BLM: Comprehension

NOT: 978-0-618-65615-8

40. ANS:

$$8s^3 - 36s^2t + 54st^2 - 27t^3$$

PTS: 1 DIF: Level B REF: MAL21437

NAT: NCTM 9-12.NOP.2.c | NCTM 9-12.DAP.4.e

TOP: Lesson 10.2 Use Combinations and the Binomial Theorem

KEY: cubic | expand | binomial theorem BLM: Comprehension

NOT: 978-0-618-65615-8

41. ANS:

$$27s^3 - 54s^2t + 36st^2 - 8t^3$$

PTS: 1 DIF: Level B REF: MAL21438

NAT: NCTM 9-12.NOP.2.c | NCTM 9-12.DAP.4.e

TOP: Lesson 10.2 Use Combinations and the Binomial Theorem

KEY: expand | cubic | binomial theorem BLM: Comprehension

NOT: 978-0-618-65615-8

42. ANS:

$$A^4 - 8A^3B + 24A^2B^2 - 32AB^3 + 16B^4$$

PTS: 1 DIF: Level B REF: MAL21439

NAT: NCTM 9-12.NOP.2.c | NCTM 9-12.DAP.4.e

TOP: Lesson 10.2 Use Combinations and the Binomial Theorem

KEY: fourth power | expand | binomial theorem BLM: Comprehension

NOT: 978-0-618-65615-8

43. ANS:

120

PTS: 1 DIF: Level B REF: MAL21440

TOP: Lesson 10.2 Use Combinations and the Binomial Theorem

KEY: coefficient | expansion | binomial theorem BLM: Comprehension

NOT: 978-0-618-65615-8

44. ANS:

210

PTS: 1 DIF: Level B REF: MAL21441

TOP: Lesson 10.2 Use Combinations and the Binomial Theorem

KEY: coefficient | expansion | binomial theorem BLM: Comprehension

NOT: 978-0-618-65615-8

45. ANS:
252

PTS: 1 DIF: Level B REF: MAL21442
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: coefficient | expansion | binomial theorem BLM: Comprehension
NOT: 978-0-618-65615-8

46. ANS:

Answers will vary. Sample answers are given. permutations: basketball, baseball, field hockey;
combinations: cross country, swimming, volleyball

PTS: 1 DIF: Level C REF: MAL21444 STA: AL.COS.MTH.03.AL2.3.2
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: combinations | Permutations BLM: Comprehension
NOT: 978-0-618-65615-8

47. ANS:

a. ${}_{23}C_{20} = 1771$; Combinations are appropriate because the order in which the passengers arrive is not important. In addition, there are no assigned seats so the order in which the passengers sit in the seats doesn't matter.

b. ${}_{23}C_{21} + {}_{23}C_{22} + {}_{23}C_{23} = 277$; More than 20 means 21 or 22 or 23, so all three subsets sizes must be added. The airline is concerned about these subsets because these are the subsets that contain more passengers than seats in coach.

c. The airline needs exactly 4 of the 6 first class passengers and 20 of the 23 coach passengers, so multiply the number of possible subsets of first class passenger times the number of possible subsets of coach passengers. ${}_6C_4 \cdot {}_{23}C_{20} = 26,565$

d. Since there are a total of 24 seats, if more than 24 people out of the total of 29 people with reservations show up, there won't be enough seats. More than 24 means 25 or 26 or 27 or 28 or 29 so all the subset sizes must be added.

$${}_{29}C_{25} + {}_{29}C_{26} + {}_{29}C_{27} + {}_{29}C_{28} + {}_{29}C_{29} = 27,891$$

PTS: 1 DIF: Level C REF: A2.10.02.ER.02
NAT: NCTM 9-12.NOP.2.c | NCTM 9-12.REA.1 | NCTM 9-12.DAP.4.e | NCTM 9-12.PRS.4 | NCTM 9-12.COM.3 STA: NJ 4.5.D.6 | NJ 4.5.A.5 | NJ 4.5.D.2 | NJ 4.4.C.1
TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
KEY: Combinations | real-world | extended response BLM: Application
NOT: 978-0-618-65615-8

48. ANS:

Yes, for example ${}_{20}C_5 = {}_{20}C_{15} = 15,504$. Each time a subset of size $r = 5$ is chosen, a subset of size $n - r = 15$ is left, and each time a subset of size $r = 15$ is chosen, a subset of size $n - r = 5$ is left. In both cases, $20!$ is divided by the product of $5!$ and $15!$.

The same is not true for permutations. In ${}_{20}P_5$ only 5 different items are being arranged while in ${}_{20}P_{15}$ 15 different items are being arranged. Since order matters, there will be more permutations of the bigger number of items, so ${}_{20}P_{15} > {}_{20}P_5$.

PTS: 1 DIF: Level C REF: A2.10.02.WR.03
 NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.NOP.2.c | NCTM 9-12.COM.3 | NCTM 9-12.PRS.4 | NCTM 9-12.REA.1 STA: NJ 4.4.C.1 | NJ 4.5.A.5 | NJ 4.5.D.2 | NJ 4.5.D.6
 TOP: Lesson 10.2 Use Combinations and the Binomial Theorem
 KEY: Permutations | combinations | skill | writing BLM: Analysis
 NOT: 978-0-618-65615-8

49. ANS: D PTS: 1 DIF: Level A REF: MAL21445
 TOP: Lesson 10.3 Define and Use Probability KEY: probability | grab-bag | event
 BLM: Comprehension NOT: 978-0-618-65615-8

50. ANS:

1

PTS: 1 DIF: Level B REF: MAL21446
 TOP: Lesson 10.3 Define and Use Probability KEY: event | probability
 BLM: Comprehension NOT: 978-0-618-65615-8

51. ANS: C PTS: 1 DIF: Level A REF: MAL21447
 TOP: Lesson 10.3 Define and Use Probability KEY: probability | event
 BLM: Comprehension NOT: 978-0-618-65615-8

52. ANS:

a. $\frac{1}{6}$

b. $\frac{13}{60}$

PTS: 1 DIF: Level B REF: MAL21448
 TOP: Lesson 10.3 Define and Use Probability KEY: probability | experimental
 BLM: Comprehension NOT: 978-0-618-65615-8

53. ANS: B PTS: 1 DIF: Level B REF: MAL21449
 TOP: Lesson 10.3 Define and Use Probability KEY: probability | dice | experimental
 BLM: Comprehension NOT: 978-0-618-65615-8

54. ANS:

Answers will vary. Sample answers are given.

a. rolling a sum of 13 on a pair of dice

b. rolling a number between 1 and 6 on a die, including one and six.

PTS: 1 DIF: Level B REF: MAL21450
 TOP: Lesson 10.3 Define and Use Probability KEY: event | probability
 BLM: Comprehension NOT: 978-0-618-65615-8

55. ANS:

$$\frac{1}{120}$$

PTS: 1 DIF: Level B REF: MAL21452 STA: AL.COS.MTH.03.AL2.12.1
 TOP: Lesson 10.3 Define and Use Probability KEY: permutation | probability
 BLM: Comprehension NOT: 978-0-618-65615-8

56. ANS: C PTS: 1 DIF: Level B REF: MAL21453
 STA: AL.COS.MTH.03.AL2.12.1 TOP: Lesson 10.3 Define and Use Probability
 KEY: probability | formula | combination BLM: Comprehension
 NOT: 978-0-618-65615-8

57. ANS: B PTS: 1 DIF: Level B REF: MAL21454
 TOP: Lesson 10.3 Define and Use Probability KEY: odds | event | simple
 BLM: Comprehension NOT: 978-0-618-65615-8

58. ANS: B PTS: 1 DIF: Level B REF: MAL21455
 TOP: Lesson 10.3 Define and Use Probability KEY: odds | event | simple
 BLM: Comprehension NOT: 978-0-618-65615-8

59. ANS: B PTS: 1 DIF: Level B REF: MAL21456
 TOP: Lesson 10.3 Define and Use Probability KEY: odds | event | probability
 BLM: Comprehension NOT: 978-0-618-65615-8

60. ANS:
 1 to 7

PTS: 1 DIF: Level B REF: MAL21457
 TOP: Lesson 10.3 Define and Use Probability KEY: word | odds | event
 BLM: Comprehension NOT: 978-0-618-65615-8

61. ANS:
 Answers will vary. A sample answer is given. The manager of a small movie theater believes that most of his customers prefer the right side of the theater. He stands between the doors of the theater and counts the number of people that enter by each door. He then finds the ratio of the number of people that used the right door(s) to the total number of people who entered the theater.

PTS: 1 DIF: Level B REF: MAL21461
 TOP: Lesson 10.3 Define and Use Probability KEY: Experimental probability
 BLM: Application NOT: 978-0-618-65615-8

62. ANS:
 $\frac{2}{3}$

PTS: 1 DIF: Level B REF: MAL21462
 TOP: Lesson 10.3 Define and Use Probability KEY: probability | event | geometry
 BLM: Comprehension NOT: 978-0-618-65615-8

63. ANS:

$$\frac{\pi}{8}$$

PTS: 1 DIF: Level C REF: MAL21463
 TOP: Lesson 10.3 Define and Use Probability KEY: probability | geometry
 BLM: Comprehension NOT: 978-0-618-65615-8

64. ANS:

$$\frac{8 - \pi}{8}$$

PTS: 1 DIF: Level C REF: MAL21464
 TOP: Lesson 10.3 Define and Use Probability KEY: probability | geometry
 BLM: Comprehension NOT: 978-0-618-65615-8

65. ANS:

$$\frac{2}{\pi}$$

PTS: 1 DIF: Level C REF: MAL21465
 TOP: Lesson 10.3 Define and Use Probability KEY: probability | geometry
 BLM: Comprehension NOT: 978-0-618-65615-8

66. ANS:

Answers will vary. A sample answer is given. Use a random number table or a calculator that generates random numbers. Let each two-digit number model an attempted shot, with 00 representing 100. Read 10 pairs of random numbers. Each number from 01 to 75 means he made the free throw, and each number from 76 to 99 and 00 means he missed the shot. This experiment is a model for 10 attempts per trial.

PTS: 1 DIF: Level C REF: MAL21466
 TOP: Lesson 10.3 Define and Use Probability KEY: probability
 BLM: Application NOT: 978-0-618-65615-8

67. ANS:

a. $\frac{240}{800} = 0.3$ or 30%

b. The probability is an experimental probability since the poll did not include the entire population of likely voters, just a sample of 800.

c. Odds in favor: $\frac{350}{450} = \frac{7}{9}$ or 7:9; Odds against: $\frac{450}{350} = \frac{9}{7}$ or 9:7

d. They are reciprocals. The odds would be reciprocals for any numbers because the number in favor plus the number against must add up to the total in the sample, so the number in favor is the total in the sample minus the number against. To change odds in favor to odds against or vice versa simply switch the values between the numerator and the denominator.

PTS: 1 DIF: Level A REF: A2.10.03.ER.04
 STA: NJ 4.4.B.5 TOP: Lesson 10.3 Define and Use Probability
 KEY: Experimental probability | odds | real-world | extended response
 BLM: Application NOT: 978-0-618-65615-8

68. ANS:

$$\frac{1}{3}$$

PTS: 1 DIF: Level A REF: MAL21467 NAT: NCTM 9-12.DAP.4.e
 STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability | disjoint events BLM: Comprehension
 NOT: 978-0-618-65615-8

69. ANS:

0.021

PTS: 1 DIF: Level B REF: MAL21468 NAT: NCTM 9-12.DAP.4.e
 STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: union | probability | event | compound | disjoint events BLM: Comprehension
 NOT: 978-0-618-65615-8

70. ANS: C

PTS: 1

DIF: Level B

REF: MAL21469

NAT: NCTM 9-12.DAP.4.e

TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events

KEY: event | probability | compound BLM: Comprehension

NOT: 978-0-618-65615-8

71. ANS:

a. $\frac{9}{10}$

b. $\frac{7}{10}$

PTS: 1 DIF: Level B REF: MAL21470 NAT: NCTM 9-12.DAP.4.e
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability | event BLM: Comprehension
 NOT: 978-0-618-65615-8

72. ANS:

a. $\frac{4}{5}$

b. $\frac{7}{10}$

PTS: 1 DIF: Level B REF: MAL21470 NAT: NCTM 9-12.DAP.4.e
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability | event BLM: Comprehension
 NOT: 978-0-618-65615-8

73. ANS:

$$\frac{2}{5}$$

PTS: 1 DIF: Level B REF: MAL21471 NAT: NCTM 9-12.DAP.4.e
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: event | probability BLM: Application NOT: 978-0-618-65615-8

74. ANS:

0.84

PTS: 1 DIF: Level B REF: MAL21472 NAT: NCTM 9-12.DAP.4.e
 STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: union | probability | intersection BLM: Comprehension
 NOT: 978-0-618-65615-8

75. ANS:

0.21

PTS: 1 DIF: Level B REF: MAL21473 NAT: NCTM 9-12.DAP.4.e
 STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: intersection | union | probability BLM: Comprehension
 NOT: 978-0-618-65615-8

76. ANS:

0.11

PTS: 1 DIF: Level B REF: MAL21474 NAT: NCTM 9-12.DAP.4.e
 STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: union | probability | intersection BLM: Comprehension
 NOT: 978-0-618-65615-8

77. ANS:

a. $\frac{3}{10}$

b. $\frac{1}{5}$

PTS: 1 DIF: Level B REF: MAL21475
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: event | probability BLM: Comprehension
 NOT: 978-0-618-65615-8

78. ANS:

$$\frac{1}{15}$$

PTS: 1 DIF: Level B REF: MAL21476
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability | event | compound BLM: Comprehension
 NOT: 978-0-618-65615-8

79. ANS:

0.9

PTS: 1 DIF: Level B REF: MAL21477 NAT: NCTM 9-12.DAP.4.e
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability | at least BLM: Comprehension
 NOT: 978-0-618-65615-8

80. ANS:

0.58

PTS: 1 DIF: Level B REF: MAL21478 NAT: NCTM 9-12.DAP.4.e
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability | at least BLM: Comprehension
 NOT: 978-0-618-65615-8

81. ANS:

0.60

PTS: 1 DIF: Level B REF: MAL21479 NAT: NCTM 9-12.DAP.4.e
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability BLM: Comprehension NOT: 978-0-618-65615-8

82. ANS:

overlapping; $P(A \text{ or } B) = \frac{5}{8}$

PTS: 1 DIF: Level B REF: MAL21480 NAT: NCTM 9-12.DAP.4.e
 STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability | determine | overlapping BLM: Knowledge
 NOT: 978-0-618-65615-8

83. ANS:

disjoint; $P(A \text{ or } B) = \frac{3}{8}$

PTS: 1 DIF: Level B REF: MAL21481 NAT: NCTM 9-12.DAP.4.e
 STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: determine | probability | disjoint BLM: Knowledge NOT: 978-0-618-65615-8

84. ANS:

$$\frac{40}{52} = \frac{10}{13}$$

PTS: 1 DIF: Level B REF: MAL21482 NAT: NCTM 9-12.DAP.4.e
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability BLM: Application NOT: 978-0-618-65615-8

85. ANS:

$$\frac{9}{13}$$

PTS: 1 DIF: Level B REF: MAL21483 NAT: NCTM 9-12.DAP.4.e
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability BLM: Application NOT: 978-0-618-65615-8

86. ANS:

$$\frac{36}{52} = \frac{9}{13}$$

PTS: 1 DIF: Level B REF: MAL21484 NAT: NCTM 9-12.DAP.4.e
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability BLM: Application NOT: 978-0-618-65615-8

87. ANS:

0.28

PTS: 1 DIF: Level A REF: MAL21485
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability | complement BLM: Knowledge NOT: 978-0-618-65615-8

88. ANS:

0.53

PTS: 1 DIF: Level A REF: MAL21486
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability | complement BLM: Knowledge NOT: 978-0-618-65615-8

89. ANS:

0.13

PTS: 1 DIF: Level A REF: MAL21487
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability | complement BLM: Knowledge NOT: 978-0-618-65615-8

90. ANS:

$$\frac{5}{6}$$

PTS: 1 DIF: Level B REF: MAL21488
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability | complement BLM: Comprehension
 NOT: 978-0-618-65615-8

91. ANS: A PTS: 1 DIF: Level B REF: MAL21489
 TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events
 KEY: probability | complement BLM: Comprehension
 NOT: 978-0-618-65615-8

92. ANS:

a. $\frac{7}{13}$; there are a total of 26 students in the class with 12 of them girls, so $P(A) = \frac{12}{26} = \frac{6}{13}$. Then the

probability of the complement of A is $P(\bar{A}) = 1 - \frac{6}{13} = \frac{7}{13}$.

b. No; There are 2 students that are both girls and seniors, $P(A \text{ and } B) = \frac{2}{26} = \frac{1}{13}$. Since the events overlap, the events are not disjoint.

c. $P(A \text{ or } B) = \frac{6}{13} + \frac{7}{26} - \frac{1}{13} = \frac{17}{26}$

d. $P(\bar{A} \text{ or } B) = \frac{7}{13} + \frac{7}{26} - \frac{5}{26} = \frac{16}{26} = \frac{8}{13}$

e. Yes. Just find $P(A \text{ or } \bar{B}) = \frac{12}{26} + \frac{19}{26} - \frac{10}{26} = \frac{21}{26}$.

PTS: 1 DIF: Level C REF: A2.10.04.ER.05

NAT: NCTM 9-12.DAP.4.e

TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events

KEY: Probability | disjoint events | real-world | extended response

BLM: Application NOT: 978-0-618-65615-8

93. ANS:

a. No; If they were disjoint, then $P(A \text{ or } B) = P(A) + P(B)$. For a student at this school $P(A) = 0.40$ and $P(B) = 0.70$, so $P(A) + P(B) = 1.10$. Since the probability can't be greater than one, A and B can't be disjoint.

b. There must be some students at the school who have part time jobs and also participate in extracurricular activities.

c. 27%; For events that are not disjoint, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$. For this school $0.83 = 0.4 + 0.7 - P(A \text{ and } B)$. Solving for $P(A \text{ and } B)$ yields $P(A \text{ and } B) = 0.27$.

PTS: 1 DIF: Level C REF: A2.10.04.SR.06

NAT: NCTM 9-12.DAP.4.e

TOP: Lesson 10.4 Find Probabilities of Disjoint and Overlapping Events

KEY: Probability | disjoint events | real-world | short-response

BLM: Application NOT: 978-0-618-65615-8

94. ANS:

$$\frac{1}{12}$$

PTS: 1 DIF: Level B REF: MAL21490 STA: AL.COS.MTH.03.AL2.12.3

TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events

KEY: probability | independent | event BLM: Comprehension

NOT: 978-0-618-65615-8

95. ANS: D PTS: 1 DIF: Level A REF: MAL21491
 NAT: NCTM 9-12.DAP.4.e STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | independent BLM: Comprehension
 NOT: 978-0-618-65615-8

96. ANS: C PTS: 1 DIF: Level A REF: MAL21492
 NAT: NCTM 9-12.DAP.4.e STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | independent events BLM: Comprehension
 NOT: 978-0-618-65615-8

97. ANS:
 0.48

PTS: 1 DIF: Level A REF: MAL21493
 NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | independent | intersection BLM: Knowledge
 NOT: 978-0-618-65615-8

98. ANS:
 0.224

PTS: 1 DIF: Level A REF: MAL21494
 NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: intersection | probability | independent BLM: Knowledge
 NOT: 978-0-618-65615-8

99. ANS:
 $\frac{1}{2}$

PTS: 1 DIF: Level A REF: MAL21495
 NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | independent BLM: Knowledge NOT: 978-0-618-65615-8

100. ANS:
 $\frac{49}{289} \approx 0.17$

PTS: 1 DIF: Level B REF: MAL21496
 NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | independent events BLM: Comprehension
 NOT: 978-0-618-65615-8

101. ANS:

$$\frac{100}{289} \approx 0.35$$

PTS: 1 DIF: Level B REF: MAL21497
 NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | independent events BLM: Comprehension
 NOT: 978-0-618-65615-8

102. ANS:

$$\frac{140}{289} \approx 0.48$$

PTS: 1 DIF: Level B REF: MAL21498
 NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | independent events BLM: Comprehension
 NOT: 978-0-618-65615-8

103. ANS:

$$\frac{1}{16}$$

PTS: 1 DIF: Level B REF: MAL21499
 NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | multiplication | independent | events | rule | discrete
 BLM: Comprehension NOT: 978-0-618-65615-8

104. ANS: C

PTS: 1

DIF: Level B

REF: MAL21500

NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | complement | independent events BLM: Application
 NOT: 978-0-618-65615-8

105. ANS: A

PTS: 1

DIF: Level B

REF: MAL21502

NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | independent events BLM: Application NOT: 978-0-618-65615-8

106. ANS: C

PTS: 1

DIF: Level B

REF: MAL21503

NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | without replacement | word | dependent BLM: Comprehension
 NOT: 978-0-618-65615-8

107. ANS: A

PTS: 1

DIF: Level B

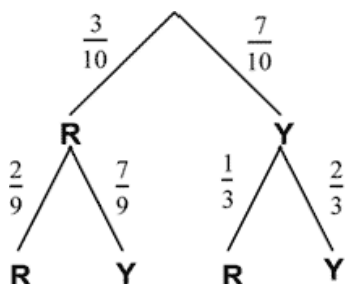
REF: MAL21504

STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: dependent | event | probability BLM: Comprehension
 NOT: 978-0-618-65615-8

108. ANS:

Sample answer: A marble is drawn from a jar containing 3 red and 7 yellow marbles, and set aside. A second marble is drawn. Find the probability that the marbles are the same color.

Answer: $\frac{8}{15} \approx 0.53$



PTS: 1 DIF: Level B REF: MAL21505
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: dependent events | probability | tree diagram BLM: Application
 NOT: 978-0-618-65615-8

109. ANS: D PTS: 1 DIF: Level A REF: MAL21506
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: independent | dependent | event BLM: Knowledge NOT: 978-0-618-65615-8
110. ANS: B PTS: 1 DIF: Level A REF: MAL21507
 NAT: NCTM 9-12.DAP.4.d
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: event | probability | independent BLM: Knowledge NOT: 978-0-618-65615-8

111. ANS:

independent; $\frac{1}{7}$

PTS: 1 DIF: Level B REF: MAL21508
 NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | independent | event BLM: Application NOT: 978-0-618-65615-8

112. ANS:

dependent; $\frac{85}{276}$

PTS: 1 DIF: Level B REF: MAL21509
 NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: dependent | probability BLM: Application NOT: 978-0-618-65615-8

113. ANS:

$$\frac{14}{55}$$

PTS: 1 DIF: Level B REF: MAL21510
 STA: AL.COS.MTH.03.AL2.12.1 | AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | independent BLM: Application NOT: 978-0-618-65615-8

114. ANS:

$$\frac{7}{253}$$

PTS: 1 DIF: Level B REF: MAL21511 STA: AL.COS.MTH.03.AL2.12.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: probability | dependent events BLM: Application NOT: 978-0-618-65615-8

115. ANS:

a. $\frac{25}{64}; \frac{5}{11}$; there are a total of 128 cars on the lot, of which 50 are American, so $P(A) = \frac{50}{128} = \frac{25}{64}$. Of

the 33 compact cars, 15 are American, so $P(A|B) = \frac{15}{33} = \frac{5}{11}$.

b. No; $P(A) = \frac{25}{64} \neq P(A|B) = \frac{5}{11}$, so the events are not independent.

c. $\frac{{}^{15}C_3}{{}^{128}C_3} = \frac{15 \cdot 14 \cdot 13}{128 \cdot 127 \cdot 126} \approx 0.0013$

d. Dependent; since the probabilities that compact American cars are sold depends on the cars in the lot, the probability that the second and third cars sold are compact American cars depends on the previous sales, so the sales are dependent.

e. Answers may vary. Sample answer: Let C be the event that the car is Japanese. (Or C could be the event that the car is European.)

PTS: 1 DIF: Level C REF: A2.10.05.ER.07
 NAT: NCTM 9-12.DAP.4.e | NCTM 9-12.DAP.4.d STA: NJ 4.4.B.4.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: Probability | dependent events | independent events | real-world | extended response
 BLM: Application NOT: 978-0-618-65615-8

116. ANS:

Approximately 0.556 or 55.6%

PTS: 1 DIF: Level C REF: A2.10.05.FR.09
 STA: NJ 4.4.B.4.2 | NJ 4.4.C.1
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: Free Response | probability | combinations | complement
 BLM: Application NOT: 978-0-618-65615-8

117. ANS:

a. $\left(\frac{7}{75}\right)^3 \approx 0.0008$; since the names are replaced, the probability of selecting a manager is the same on each trial. Therefore, the selections are independent.

b. $\frac{68}{75} \approx 0.907$; since the names are not replaced, the probability of selecting a non-manager to win the second and third trips depends on a non-manager winning the previous trips. Therefore, the selections are dependent.

PTS: 1 DIF: Level A REF: A2.10.05.SR.08
 NAT: NCTM 9-12.DAP.4.d | NCTM 9-12.DAP.4.e STA: NJ 4.4.B.4.3
 TOP: Lesson 10.5 Find Probabilities of Independent and Dependent Events
 KEY: Dependent events | independent events | real-world | short response
 BLM: Application NOT: 978-0-618-65615-8

118. ANS:

Ways of Getting Heads When Tossing Five Coins							
Number of Heads	0	1	2	3	4	5	Total
Number of Outcomes	1	5	10	10	5	1	32
Probability	$\frac{1}{32}$	$\frac{5}{32}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{5}{32}$	$\frac{1}{32}$	$\frac{32}{32} = 1$

PTS: 1 DIF: Level A REF: MAL21513 NAT: NCTM 9-12.DAP.4.a
 TOP: Lesson 10.6 Construct and Interpret Binomial Distributions
 KEY: probability | coin BLM: Comprehension
 NOT: 978-0-618-65615-8

119. ANS:

0.875

PTS: 1 DIF: Level B REF: MAL21514
 TOP: Lesson 10.6 Construct and Interpret Binomial Distributions
 KEY: binomial | probability BLM: Comprehension
 NOT: 978-0-618-65615-8

120. ANS:

 ${}_{16}C_1(.5)^{16} \approx 0.0002$

PTS: 1 DIF: Level C REF: MAL21515 STA: AL.COS.MTH.03.AL2.12.1
 TOP: Lesson 10.6 Construct and Interpret Binomial Distributions
 KEY: binomial | probability | distribution BLM: Comprehension
 NOT: 978-0-618-65615-8

121. ANS:
0.318

PTS: 1 DIF: Level B REF: MAL21516
TOP: Lesson 10.6 Construct and Interpret Binomial Distributions
KEY: word | binomial distribution | probability BLM: Application
NOT: 978-0-618-65615-8

122. ANS:
 $\frac{63}{256}$

PTS: 1 DIF: Level A REF: MAL21517 NAT: NCTM 9-12.DAP.4.e
TOP: Lesson 10.6 Construct and Interpret Binomial Distributions
KEY: Pascal's triangle BLM: Comprehension
NOT: 978-0-618-65615-8

123. ANS:

Sample answer: A survey of high school students showed that 15% of the freshmen, 20% of the sophomores, 55% of the juniors, and 65% of the seniors wanted to have a holiday dance.

PTS: 1 DIF: Level B REF: MAL21518 NAT: NCTM 9-12.DAP.3.a
TOP: Lesson 10.6 Construct and Interpret Binomial Distributions
KEY: distribution | skewed BLM: Comprehension
NOT: 978-0-618-65615-8

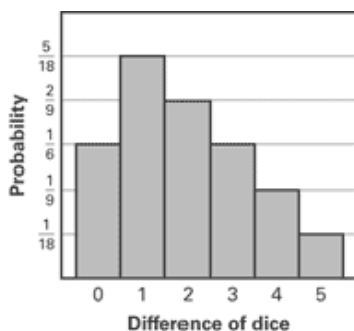
124. ANS:

1. There are exactly two outcomes for each trial.
2. The trials are independent.
3. Each trial has the same probability of success.
4. The experiment has a fixed number of trials.

PTS: 1 DIF: Level A REF: MAL21519 NAT: NCTM 9-12.DAP.1.b
TOP: Lesson 10.6 Construct and Interpret Binomial Distributions
KEY: experiment | binomial BLM: Knowledge NOT: 978-0-618-65615-8

125. ANS:

X (difference)	0	1	2	3	4	5
Outcomes	6	10	8	6	4	2
$P(X)$	$\frac{1}{6}$	$\frac{5}{18}$	$\frac{2}{9}$	$\frac{1}{6}$	$\frac{1}{9}$	$\frac{1}{18}$



PTS: 1 DIF: Level B REF: A2.10.06.FR.10
 NAT: NCTM 9-12.DAP.4.a
 TOP: Lesson 10.6 Construct and Interpret Binomial Distributions
 KEY: Free Response | probability distribution | table | histogram
 BLM: Comprehension NOT: 978-0-618-65615-8

126. ANS:

1. b
2. a
3. c

PTS: 1 DIF: Level B REF: A2.10.06.MS.12
 NAT: NCTM 9-12.DAP.1.d | NCTM 9-12.DAP.4.a
 TOP: Lesson 10.6 Construct and Interpret Binomial Distributions
 KEY: Matching | binomial distribution | histogram | symmetric | skewed
 BLM: Comprehension NOT: 978-0-618-65615-8

127. ANS:

- a. 0.30 or 30%
- b. 3
- c. 0.50 or 50%

PTS: 1 DIF: Level A REF: A2.10.06.MS.11
 NAT: NCTM 9-12.DAP.4.a
 TOP: Lesson 10.6 Construct and Interpret Binomial Distributions
 KEY: Multi-step | probability distribution | histogram BLM: Comprehension
 NOT: 978-0-618-65615-8

128. ANS:

outlier = 59	mean	median	mode	range	standard deviation
with outlier	40.0	37.0	37	26	8.7
without outlier	36.2	37.0	37	6	2.0

PTS: 1 DIF: Level B REF: MAL21520
 TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
 KEY: mean | outlier | range | standard deviation | median | mode
 BLM: Knowledge NOT: 978-0-618-65615-8

129. ANS: D PTS: 1 DIF: Level B REF: MAL21521

NAT: NCTM 9-12.DAP.1.e
 TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
 KEY: median BLM: Knowledge NOT: 978-0-618-65615-8

130. ANS: C PTS: 1 DIF: Level A REF: MAL21522

NAT: NCTM 9-12.DAP.1.e
 TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
 KEY: mode BLM: Knowledge NOT: 978-0-618-65615-8

131. ANS:

mean = \$46
 median = \$30
 mode = \$20
 range = \$80

PTS: 1 DIF: Level B REF: MAL21523
 NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a
 TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
 KEY: mode | solve | word | mean | median | range | central tendency
 BLM: Application NOT: 978-0-618-65615-8

132. ANS:

Mean: 38; Median: 36; Mode: 29

PTS: 1 DIF: Level B REF: MAL21524
 NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a
 TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
 KEY: mean | median | mode BLM: Application NOT: 978-0-618-65615-8

133. ANS:

Mean: 66.7; Median: 64; Mode: 77

PTS: 1 DIF: Level B REF: MAL21525
 NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a
 TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
 KEY: mode | mean | median BLM: Application NOT: 978-0-618-65615-8

134. ANS:
Mean: 91.9; Median: 91.5; Mode: 90
- PTS: 1 DIF: Level B REF: MAL21526
TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
KEY: mean | median | mode BLM: Application NOT: 978-0-618-65615-8
135. ANS:
90
- PTS: 1 DIF: Level A REF: MAL21528
NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a
TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
KEY: range | data BLM: Application NOT: 978-0-618-65615-8
136. ANS:
 ≈ 26.9
- PTS: 1 DIF: Level B REF: MAL21529
NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a
TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
KEY: standard deviation BLM: Application NOT: 978-0-618-65615-8
137. ANS:
20.7; 28; ≈ 8.58
- PTS: 1 DIF: Level B REF: MAL21530
NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a
TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
KEY: mean | standard deviation | range BLM: Application NOT: 978-0-618-65615-8
138. ANS:
68.2; 23; ≈ 6.87
- PTS: 1 DIF: Level B REF: MAL21531
NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a
TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
KEY: mean | standard deviation | range BLM: Application NOT: 978-0-618-65615-8
139. ANS: D PTS: 1 DIF: Level B REF: MAL21532
NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a
TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
KEY: range | outlier | data BLM: Application NOT: 978-0-618-65615-8
140. ANS: C PTS: 1 DIF: Level B REF: MAL21533
NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a
TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
KEY: data | range | outlier BLM: Application NOT: 978-0-618-65615-8
141. ANS: B PTS: 1 DIF: Level B REF: MAL21534
NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a
TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
KEY: range | outlier | data BLM: Application NOT: 978-0-618-65615-8

142. ANS:
Sample answer: 10, 10, 10, 10, 9, 11

PTS: 1 DIF: Level B REF: MAL21535
TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
KEY: mean | median | mode BLM: Comprehension
NOT: 978-0-618-65615-8

143. ANS:
Sample answer: The mean, median, and range make the two classes seem very similar in their mastery of the content. The standard deviation indicates that the second period class has more variation in the level of mastery.

	First period	Second period
Mean	6	6
Median	6	6
Mode	5 and 6	10
Range	8	9
Standard deviation	2	≈ 3.46

PTS: 1 DIF: Level C REF: MAL21536
TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
KEY: measures of central tendency | variation BLM: Analysis
NOT: 978-0-618-65615-8

144. ANS:
- a. mean = $80\frac{9}{11}$ points, median = 82 points, range = 45 points, standard deviation ≈ 12.1866 points
- b. mean = $66\frac{8}{11}$ points, median = 67 points, range = 27 points, standard deviation ≈ 7.3372 points
- c. Sample answer: All the statistics are higher for the home games. The team scores more points on average at home, both the mean and median are higher for home games. However, the team is more consistent on the road, the range and standard deviation are smaller for road games.
- d. Sample answer: Mean = 84 points, median = 84 points, range = 25 points, standard deviation ≈ 7.2111 points; The range and standard deviation for the home games are now slightly smaller than the range and standard deviation for the away games, so the team is about as consistent at home as away if the game when they scored 49 points is removed.

PTS: 1 DIF: Level C REF: A2.11.01.ER.01
NAT: NCTM 9-12.DAP.2.a | NCTM 9-12.DAP.1.e
TOP: Lesson 11.1 Find Measures of Central Tendency and Dispersion
KEY: Statistics | real-world | extended response | standard deviation | mean | median | range
BLM: Analysis NOT: 978-0-618-65615-8

145. ANS:
mean = 35, standard deviation = 3
- PTS: 1 DIF: Level B REF: MAL21537
NAT: NCTM 9-12.DAP.2.a | NCTM 9-12.DAP.1.e
TOP: Lesson 11.2 Apply Transformations to Data KEY: data | mean | standard deviation
BLM: Application NOT: 978-0-618-65615-8
146. ANS:
Sample answer: When a constant value is added to every value in a data set, the mean and the median are translated by the constant value, while the range and the standard deviation remain the same.
- PTS: 1 DIF: Level B REF: MAL21538 NAT: NCTM 9-12.DAP.2.a
TOP: Lesson 11.2 Apply Transformations to Data
KEY: mean | median | standard deviation | range | distribution BLM: Comprehension
NOT: 978-0-618-65615-8
147. ANS:
a. \$290.80; \$291
b. \$39; \approx \$13.23
c. \$319.88; \$320.10; \$42.90; \$14.55
- PTS: 1 DIF: Level B REF: MAL21539 NAT: NCTM 9-12.DAP.2.d
TOP: Lesson 11.2 Apply Transformations to Data KEY: mean | median | range | data
BLM: Application NOT: 978-0-618-65615-8
148. ANS:
a. \$5.15; \$4.96
b. \$2.28; \approx \$0.81
c. \$5.67; \$5.46; \$2.51; \$0.89
- PTS: 1 DIF: Level B REF: MAL21540
NAT: NCTM 9-12.DAP.2.a | NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.d
TOP: Lesson 11.2 Apply Transformations to Data KEY: data | mean | median | range
BLM: Application NOT: 978-0-618-65615-8
149. ANS:
\$48.50, \$339.50
- PTS: 1 DIF: Level B REF: MAL21541
NAT: NCTM 9-12.DAP.2.a | NCTM 9-12.DAP.1.e
TOP: Lesson 11.2 Apply Transformations to Data KEY: median | range | data | multiply
BLM: Application NOT: 978-0-618-65615-8
150. ANS:
The mean, median, range, and standard deviation are multiplied by the constant.
- PTS: 1 DIF: Level B REF: MAL21542 NAT: NCTM 9-12.DAP.2.d
TOP: Lesson 11.2 Apply Transformations to Data
KEY: mean | median | standard deviation | range BLM: Comprehension
NOT: 978-0-618-65615-8

151. ANS:

- a. mean = \$637.50, median = \$650, mode = \$650, range = \$475, and standard deviation \approx \$128.09.
 b. mean = \$687.50, median = \$700, mode = \$700, range = \$475, and standard deviation \approx \$128.09; the measures of central tendency will increase by \$50 since all the values are increased by \$50. However, since all the values are increased by the same amount, the data is no more spread out, so the measures of dispersion don't change.
 c. mean = \$701.25, median = \$715, mode = \$715, range = \$522.50, and standard deviation \approx \$140.90; all the measures will be increased by 10%. The rents all increase and the rents also get more spread out because the lower rents will be raised by amounts less than \$50 and the higher rents will be raised by amounts greater than \$50.

PTS: 1 DIF: Level C REF: A2.11.02.SR.02
 NAT: NCTM 9-12.DAP.2.d | NCTM 9-12.DAP.2.a | NCTM 9-12.DAP.1.e
 TOP: Lesson 11.2 Apply Transformations to Data
 KEY: Transforming data | statistics | real-world | short response
 BLM: Application NOT: 978-0-618-65615-8

152. ANS:

0.135

PTS: 1 DIF: Level B REF: MAL21543
 TOP: Lesson 11.3 Use Normal Distributions KEY: normal distribution | probability
 BLM: Application NOT: 978-0-618-65615-8

153. ANS:

Answers will vary. A sample answer is given: the IQ scores for a large population of people.

PTS: 1 DIF: Level B REF: MAL21544
 TOP: Lesson 11.3 Use Normal Distributions KEY: normal distribution
 BLM: Comprehension NOT: 978-0-618-65615-8

154. ANS:

2.5%

PTS: 1 DIF: Level B REF: MAL21546
 TOP: Lesson 11.3 Use Normal Distributions
 KEY: word | model | distribution | normal | percent BLM: Application
 NOT: 978-0-618-65615-8

155. ANS:

- a. $72 \leq x \leq 92$
 b. about 81.5%

PTS: 1 DIF: Level B REF: MAL21548
 TOP: Lesson 11.3 Use Normal Distributions
 KEY: mean | standard deviation | normal distribution BLM: Application
 NOT: 978-0-618-65615-8

156. ANS: A

PTS: 1 DIF: Level B REF: MAL21549
 NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a
 TOP: Lesson 11.3 Use Normal Distributions KEY: standard deviation | z-score
 BLM: Application NOT: 978-0-618-65615-8

157. ANS:

a. ≈ -3.53 b. ≈ 2.94

PTS: 1 DIF: Level B REF: MAL21550

NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a

TOP: Lesson 11.3 Use Normal Distributions

KEY: standard deviation | z-score

BLM: Application NOT: 978-0-618-65615-8

158. ANS:

0.9918

PTS: 1 DIF: Level B REF: MAL21551

NAT: NCTM 9-12.DAP.1.e | NCTM 9-12.DAP.2.a

TOP: Lesson 11.3 Use Normal Distributions

KEY: standard deviation | z-score

BLM: Application NOT: 978-0-618-65615-8

159. ANS:

Sample answer: A normal distribution is modeled by a bell-shaped curve called a normal curve. The mean and median of the data are equal and both are on the line of symmetry of the curve. The 68-95-99.7 rule for a normal distribution indicates that 68% of the data are within one standard deviation of the mean, 95% of the data are within two standard deviations, and 99.7% of the data are within three standard deviations.

PTS: 1 DIF: Level C REF: MAL21552 NAT: NCTM 9-12.DAP.3.b

TOP: Lesson 11.3 Use Normal Distributions

KEY: normal distribution

BLM: Comprehension

NOT: 978-0-618-65615-8

160. ANS:

128-156; Since 170 lb is 2 standard deviations above the mean, only about 2.5% of the men should weigh more than 170 lb. So the probability is about $\frac{2.5}{100}$, or $\frac{1}{40}$. Since 128 lb is 1 standard deviation below the

mean, only about 16% of the men should weigh less than 128 lb. So the probability is about $\frac{16}{100}$, or $\frac{4}{25}$.

PTS: 1 DIF: Level C REF: MAL21451

TOP: Lesson 11.3 Define and Use Probability

KEY: evaluate | standard deviation

BLM: Analysis NOT: 978-0-618-65615-8

161. ANS: C

PTS: 1

DIF: Level A

REF: MAL21554

NAT: NCTM 9-12.DAP.1.b

TOP: Lesson 11.4 Select and Draw Conclusions from Samples

KEY: sample | method

BLM: Knowledge NOT: 978-0-618-65615-8

162. ANS: C

PTS: 1

DIF: Level A

REF: MAL21555

NAT: NCTM 9-12.DAP.1.b

TOP: Lesson 11.4 Select and Draw Conclusions from Samples

KEY: method | sample

BLM: Knowledge NOT: 978-0-618-65615-8

163. ANS: D

PTS: 1

DIF: Level A

REF: MAL21556

NAT: NCTM 9-12.DAP.1.b

TOP: Lesson 11.4 Select and Draw Conclusions from Samples

KEY: sample | method

BLM: Knowledge NOT: 978-0-618-65615-8

164. ANS: C PTS: 1 DIF: Level B REF: MAL21561
 NAT: NCTM 9-12.DAP.1.b STA: AL.COS.MTH.03.AL2.10.2
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: sample | random | survey | population BLM: Analysis
 NOT: 978-0-618-65615-8
165. ANS:
 systematic
- PTS: 1 DIF: Level B REF: MAL21558 NAT: NCTM 9-12.DAP.1.b
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: sample | method BLM: Application NOT: 978-0-618-65615-8
166. ANS:
 The sample is likely to be biased.
- PTS: 1 DIF: Level B REF: MAL21560
 NAT: NCTM 9-12.DAP.1.b | NCTM 9-12.DAP.3.b STA: AL.COS.MTH.03.AL2.10.2
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: classify | sample BLM: Analysis NOT: 978-0-618-65615-8
167. ANS:
 The sample is biased. People leaving a restaurant are more likely to go out for dinner than people in general.
- PTS: 1 DIF: Level B REF: MAL21562
 NAT: NCTM 9-12.DAP.1.b | NCTM 9-12.DAP.3.b STA: AL.COS.MTH.03.AL2.10.2
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: survey BLM: Analysis NOT: 978-0-618-65615-8
168. ANS:
 $\pm 3.3\%$; between 49.7% and 56.3%
- PTS: 1 DIF: Level B REF: MAL21564
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: sample | interval | margin of error BLM: Analysis NOT: 978-0-618-65615-8
169. ANS:
 $\pm 3.6\%$; between 55.4% and 62.6%
- PTS: 1 DIF: Level B REF: MAL21565
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: sample | margin of error | size BLM: Knowledge NOT: 978-0-618-65615-8
170. ANS:
 about 278 students
- PTS: 1 DIF: Level B REF: MAL21566
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: population | percent | margin of error BLM: Analysis
 NOT: 978-0-618-65615-8

171. ANS:

Sample answer: Systematic; the population is all the people with phone numbers listed in the phone book; the sample is not biased, because no prejudgments are made regarding the numbers selected.

PTS: 1 DIF: Level B REF: MAL21569
 NAT: NCTM 9-12.DAP.1.b | NCTM 9-12.DAP.3.b STA: AL.COS.MTH.03.AL2.10.2
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: bias | population | sample BLM: Analysis NOT: 978-0-618-65615-8

172. ANS:

Sample answer: Convenience; the population is all students who attend the school; the sample is not biased, because the surveyor has no control over who arrives at school first.

PTS: 1 DIF: Level B REF: MAL21571
 NAT: NCTM 9-12.DAP.1.b | NCTM 9-12.DAP.3.b STA: AL.COS.MTH.03.AL2.10.2
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: bias | population | sample BLM: Analysis NOT: 978-0-618-65615-8

173. ANS:

Answers may vary. Sample answer: Make a list of all 141 juniors. Assign each junior a different integer from 1 to 141. Generate 20 unique random integers. Poll the 20 students that correspond to the 20 integers you generated.

PTS: 1 DIF: Level A REF: A2.11.04.WR.05
 NAT: NCTM 9-12.DAP.1.b TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: Writing | random sample | poll BLM: Comprehension
 NOT: 978-0-618-65615-8

174. ANS:

Answers will vary. Sample answers are given.

- the time of day, the method of choosing the telephone numbers, some people cannot afford to have a telephone
- the cost of the magazine, the reading level of the magazine, the target audience of the magazine
- the availability of the TV station's signal, the method of choosing the show, the target audience for the TV show
- the type of school (public, private, magnet, and so on), the grade level of homeroom, the seriousness that students attach to the survey and their responses

PTS: 1 DIF: Level C REF: MAL21563
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: bias | sample BLM: Comprehension NOT: 978-0-618-65615-8

175. ANS:

- ± 0.025 ;
- It is likely that the exact percent of all voters who voted for candidate A is between 48.5% and 53.5%.

PTS: 1 DIF: Level B REF: A2.11.04.FR.06
 STA: NJ 4.4.A.2.3 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: Free response | margin of error | sample BLM: Analysis
 NOT: 978-0-618-65615-8

176. ANS:

Answers will vary. A sample answer is given. Suppose you wanted to take a survey in a high school. If you announced in an assembly that you needed volunteer participants, you would be getting a self-selected sample. If you chose the people in your first-period class as participants, you would be getting a convenience sample. If you chose every tenth person in an alphabetical list of students, you would be getting a systematic sample. If you put all the students' names in a box and drew out 50 names, you would be getting a random sample.

PTS: 1 DIF: Level C REF: MAL21559 STA: AL.COS.MTH.03.AL2.10.2
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: random sample | method | bias BLM: Analysis NOT: 978-0-618-65615-8

177. ANS:

The margin of error for the survey is $\pm \frac{1}{\sqrt{1800}} \approx \pm 2.4\%$. Using the margin of error for both candidates, you can conclude that Jones should receive between 41.6% to 46.4% of the votes. However, Davis should receive between 34.6% to 39.4% of the votes. Since the intervals do not overlap, you can predict that Jones should win the election.

PTS: 1 DIF: Level C REF: MAL21567
 NAT: NCTM 9-12.ALG.2.c | NCTM 9-12.CON.2 | NCTM 9-12.CON.1
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: predict | margin of error BLM: Analysis NOT: 978-0-618-65615-8

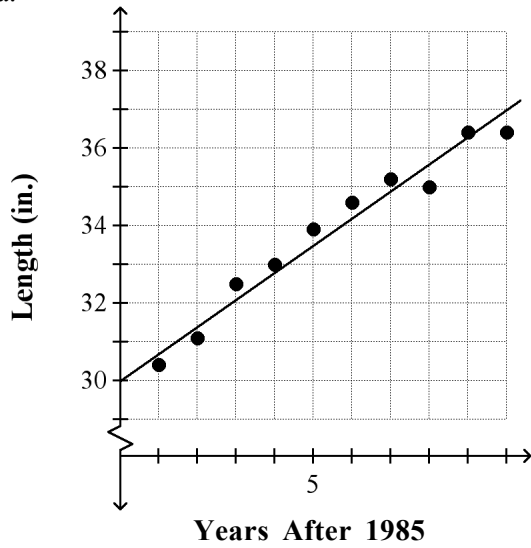
178. ANS:

The margin of error for the survey is $\pm \frac{1}{\sqrt{210}} \approx \pm 6.9\%$. Using the margin of error for both candidates, you can conclude that candidate A should receive between 49.3% to 63.1% of the votes. However, candidate B should receive between 36.9% to 50.7% of the votes. Since the intervals overlap, you cannot predict who the winner will be based on the results of the survey.

PTS: 1 DIF: Level C REF: MAL21568
 NAT: NCTM 9-12.ALG.2.c | NCTM 9-12.CON.2 | NCTM 9-12.CON.1
 TOP: Lesson 11.4 Select and Draw Conclusions from Samples
 KEY: predict | margin of error BLM: Analysis NOT: 978-0-618-65615-8

179. ANS:

a.



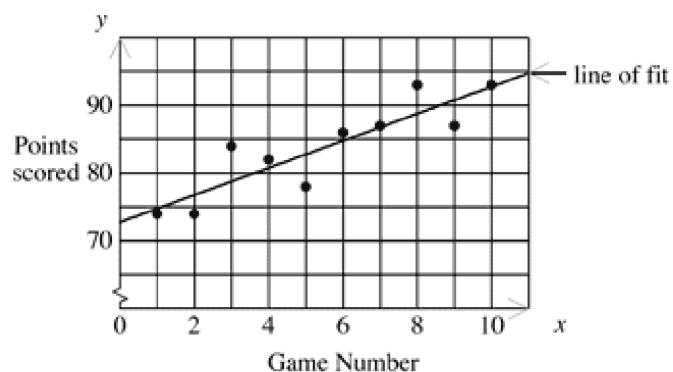
b. $y = 0.7x + 30$

c. 40.5 inches

PTS: 1 DIF: Level B REF: MAL21573
 NAT: NCTM 9-12.DAP.1.d | NCTM 9-12.ALG.3.a | NCTM 9-12.ALG.3.c | NCTM 9-12.DAP.2.e |
 NCTM 9-12.DAP.2.b
 TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data
 KEY: data | graph | evaluate | linear regression BLM: Application
 NOT: 978-0-618-65615-8

180. ANS:

a.



b. $y = 2.00x + 72.8$

PTS: 1 DIF: Level B REF: MAL21575

NAT: NCTM 9-12.DAP.1.d | NCTM 9-12.ALG.3.a | NCTM 9-12.ALG.3.c | NCTM 9-12.DAP.2.e |
NCTM 9-12.DAP.2.b

TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: data | graph | linear regression BLM: Application NOT: 978-0-618-65615-8

181. ANS: D PTS: 1 DIF: Level A REF: MAL21576

NAT: NCTM 9-12.DAP.2.e | NCTM 9-12.ALG.3.a

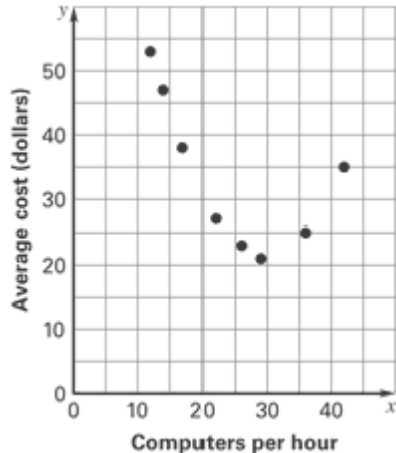
TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: function | table BLM: Comprehension

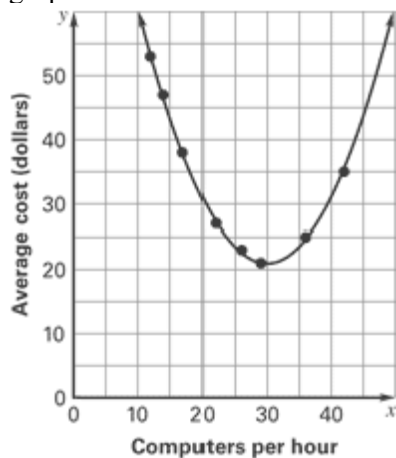
NOT: 978-0-618-65615-8

182. ANS:

a. A quadratic model seems appropriate because the points form a U-shape that a parabola would fit well.



b. $y = 0.0987x^2 - 5.93x + 110.23$; the data fits the model very well. All the points are very close to the graph.



c. $\approx \$31.11$

d. ≈ 30 computers per hour; find the x -coordinate of the vertex: $x = -\frac{b}{2a} \approx \frac{5.93}{0.1974} \approx 30$. The vertex is the minimum point on the graph. Here the x -coordinate would represent the production level that would minimize the average cost per computer for this company.

PTS: 1 DIF: Level C REF: A2.11.05.ER.03

NAT: NCTM 9-12.DAP.1.d | NCTM 9-12.DAP.2.b | NCTM 9-12.DAP.2.e | NCTM 9-12.ALG.3.a

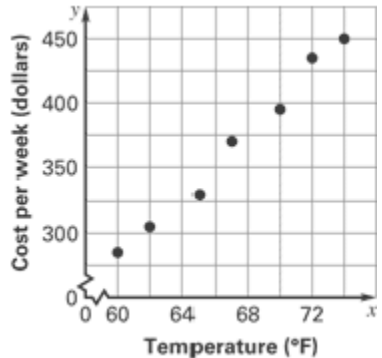
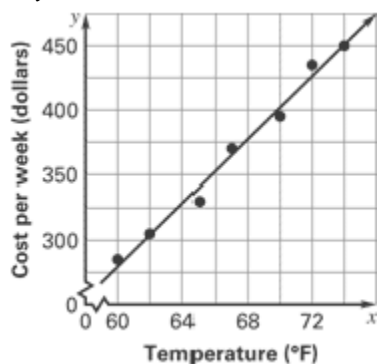
TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: Quadratic model | vertex | real-world | extended response

BLM: Analysis NOT: 978-0-618-65615-8

183. ANS:

a. The points lie approximately on a line, so a linear model seems appropriate.

b. $y = 12.20x - 452.17$; Yes, the model passes close to all the points.

c. \$377.43

PTS: 1 DIF: Level C REF: A2.11.05.SR.04

NAT: NCTM 9-12.DAP.1.d | NCTM 9-12.DAP.2.b | NCTM 9-12.DAP.2.e | NCTM 9-12.ALG.3.a | NCTM 9-12.ALG.3.c

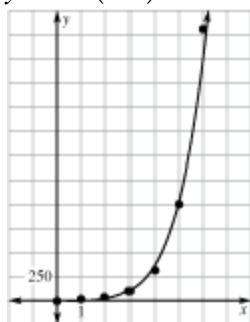
TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: Linear model | scatter plot | real-world | short response BLM: Analysis

NOT: 978-0-618-65615-8

184. ANS:

$$y = 4.4(2.9)^x$$



PTS: 1 DIF: Level B REF: 7f7c8e1b-cdbb-11db-b502-0011258082f7

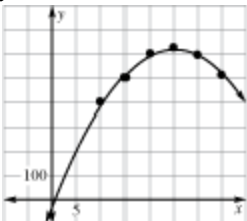
TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: Best fit | regression

BLM: Knowledge NOT: 978-0-618-65615-8

185. ANS:

$$y = -1.05x^2 + 52.03x - 24.7$$



PTS: 1 DIF: Level B REF: 7f7e6370-cdbb-11db-b502-0011258082f7

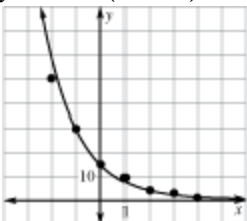
TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: Best fit | regression

BLM: Knowledge NOT: 978-0-618-65615-8

186. ANS:

$$y = 15.2(0.533)^x$$



PTS: 1 DIF: Level B REF: 7f7f7575-cdbb-11db-b502-0011258082f7

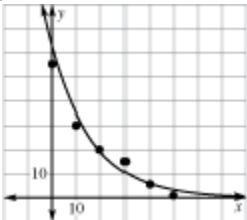
TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: Best fit | regression

BLM: Knowledge NOT: 978-0-618-65615-8

187. ANS:

$$y = 63.4(0.94)^x$$



PTS: 1 DIF: Level B REF: 7f7f9c85-cdbb-11db-b502-0011258082f7

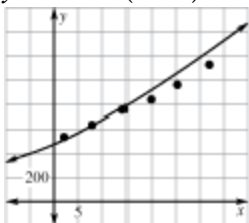
TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: Best fit | regression

BLM: Knowledge NOT: 978-0-618-65615-8

188. ANS:

$$y = 495.3(1.03)^x$$



PTS: 1 DIF: Level B REF: 7f7fc395-cdbb-11db-b502-0011258082f7

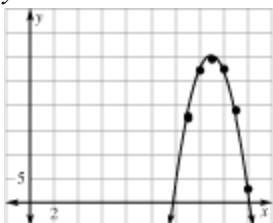
TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: Best fit | regression

BLM: Knowledge NOT: 978-0-618-65615-8

189. ANS:

$$y = -3.07x^2 + 92.21x - 662.2$$



PTS: 1 DIF: Level B REF: 7f7feaa5-cdbb-11db-b502-0011258082f7

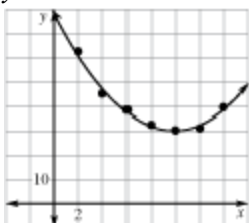
TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: Best fit | regression

BLM: Knowledge NOT: 978-0-618-65615-8

190. ANS:

$$y = 0.51x^2 - 10.02x + 79.6$$



PTS: 1 DIF: Level B REF: 7f80fcaa-cdbb-11db-b502-0011258082f7

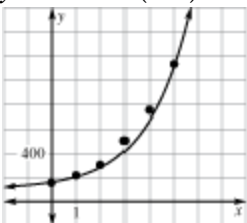
TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: Best fit | regression

BLM: Knowledge NOT: 978-0-618-65615-8

191. ANS:

$$y = 149.56(1.5)^x$$



PTS: 1

DIF: Level B

REF: 7f8123ba-cdbb-11db-b502-0011258082f7

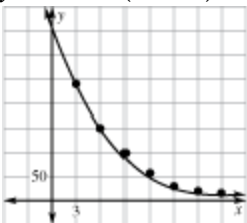
TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: Best fit | regression

BLM: Knowledge NOT: 978-0-618-65615-8

192. ANS:

$$y = 382.7(0.853)^x$$



PTS: 1

DIF: Level B

REF: 7f8283df-cdbb-11db-b502-0011258082f7

TOP: Lesson 11.5 Choose the Best Model for Two-Variable Data

KEY: Best fit | regression

BLM: Knowledge NOT: 978-0-618-65615-8