7th Grade NJ ASK / PARCC Practice

Name _____ Date _____ Class _____

7.SP.1

SELECTED RESPONSE

Select the correct answer.

1. You want to predict which movie will be the most popular among the students at your school next weekend. To do so, you ask a sample of people at your school what movie they most want to see. Which of these methods is most likely to produce a representative sample?

   (A) Ask one student at your school.

   (B) Ask a group of students in a film class.

   (C) Ask one student from each class.

   (D) Ask several of your friends.

2. The editor of a magazine wants to know the effectiveness of advertising on readers. The editor decides to call every 50th person on the subscriber list to conduct a survey. Does the editor's method produce a representative sample? Explain. (Note: A subscriber is someone who receives every issue of the magazine in the mail. A reader is someone who reads the magazine.)

   (A) Yes. All of the magazine's readers have an equal chance of being selected.

   (B) Yes. All of the magazine's subscribers have an equal chance of being selected and the business manager needs to gain information only about subscribers.

   (C) No. Not all of the magazine's subscribers have an equal chance of being selected.

   (D) No. Not all of the magazine's readers have an equal chance of being selected.

3. A politician running for mayor in her city wants to know her chances of winning an upcoming election. To figure this out, her campaign team wants to ask a sample of people in the city who they will vote for in the election. What method is likely to give the campaign team a random sample of the population?

   (A) Ask all of the people who live in a particular neighborhood.

   (B) Ask people who live in different neighborhoods throughout the city.

   (C) Ask people who take public transportation.

   (D) Ask all of the people who shop at the same store.

Select the correct answer for each lettered part.

4. Andy has 60 orange trees in his grove that are in 6 rows of 10 trees. He wants to know how many oranges he will harvest this season but does not have time to count the number of oranges on each tree. Does the method described produce a representative sample of the trees in the grove?

   a. Assign a number to each tree and pull 8 numbers from a hat. ○ Yes ○ No

   b. Select 10 trees from the same row. ○ Yes ○ No

   c. Select 3 consecutive trees. ○ Yes ○ No

   d. Randomly select 6 trees. ○ Yes ○ No

   e. Select the trees in each corner. ○ Yes ○ No

Probability and Statistics

Answers attached

Name _____ Date _____ Class _____

Select all correct answers.

5. Elaine is the manager of a small toy manufacturer. Her company produces 2,500 toys per week for shipment to retail stores. Elaine wants to know the percentage of toys her company produces that are defective. Which of the following methods would provide Elaine with a representative sample of the toys?

   (A) Assign a number to each toy, randomly select 100 numbers, and test the corresponding toys.

   (B) Test the first toy produced each week.

   (C) Select the first toy produced each day of the week and test them.

   (D) For each day, randomly pick 15 toys produced that day.

   (E) Test all toys produced on Friday.

CONSTRUCTED RESPONSE

6. A town has 40,249 residents. Members of a town's parks and recreation department want to know what band to book for the town's summer festival. Does the department need to ask every resident in the town to find out what band should play at the event? Explain.

7. A company with several different departments has its workers work one of three shifts each workday. The president of the company wants to know which of the three shifts the workers prefer. What is an efficient method for the president of the company to get this information?

8. Marilyn wants to know what the most popular sport is at her school. She randomly selects 12 players from the girls' lacrosse team to ask the question. Does her method create a representative sample of the population? Explain.

9. Leah wants to know the average arrival time of the students at her school. She arrives one morning at 7:30 a.m. and records the arrival times of the students that arrive between 7:30 a.m. and 8:00 a.m.

   a. Explain why Leah's sample is not a representative sample.

   b. Describe a method that is likely to produce a representative sample.

10. About 3,700 people shop in a mall during the week. The manager wants to find out some information about these customers.

    a. Explain the advantages of giving a survey to a random sample of 200 customers rather than to all of the 3,700 customers.

    b. What should the manager do to get a representative sample of the customers? Explain.

Name _____ Date _____ Class _____

7.SP.2

SELECTED RESPONSE

Select the correct answer.

1. There are 1,400 students in a school. A random sample of 50 students contains 7 students with birthdays in March. About how many students in the school have birthdays in March?

   (A) 28

   (B) 196

   (C) 200

   (D) 350

2. Leah is an administrator for a large school district. She wants to know how many hours students spend on homework each week. She asks the question to 250 randomly selected eighth grade students. The results are shown in the table. Which of the following inferences about the eighth grade students in the school district are valid?

Hours	Students
Less than 2	44
2 to less than 4	88
4 to less than 6	90
At least 6	28

   (A) There are more students who spend at least 4 hours per week on homework than students who spend less than 4 hours per week on homework.

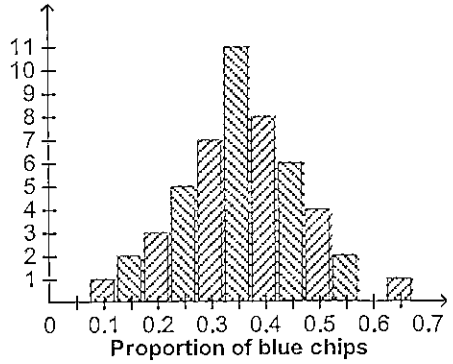
   (B) About 11% of students in the school district spend at least 6 hours per week on homework.

   (C) About 50% of students who spend less than 4 hours per week on homework spend less than 2 hours per week.

   (D) About 1 of every 3 students who spend at least 4 hours per week on homework spend at least 6 hours per week.

Select the correct answer for each lettered part.

3. Christina has a large bag that contains red chips and blue chips. She takes a random sample of 20 chips, counts the number of blue chips, and then places the chips back in the bag. Christina repeats the process until she has 50 samples. The histogram shows the frequency of the proportion of blue chips in the samples.



Use the histogram to describe the probability P of a sample of 20 chips from the bag yielding each of the following proportions of blue chips.

a. 0.10
- ○ $0 \le P < 0.1$
- ○ $0.1 \le P < 0.2$
- ○ $0.2 \le P < 0.5$

b. 0.20
- ○ $0 \le P < 0.1$
- ○ $0.1 \le P < 0.2$
- ○ $0.2 \le P < 0.5$

c. 0.35
- ○ $0 \le P < 0.1$
- ○ $0.1 \le P < 0.2$
- ○ $0.2 \le P < 0.5$

d. 0.45
- ○ $0 \le P < 0.1$
- ○ $0.1 \le P < 0.2$
- ○ $0.2 \le P < 0.5$

e. 0.55
- ○ $0 \le P < 0.1$
- ○ $0.1 \le P < 0.2$
- ○ $0.2 \le P < 0.5$

Name _____ Date _____ Class _____

CONSTRUCTED RESPONSE

4. An electronics retailer receives a shipment of 6,000 CDs to distribute to its stores. A quality control manager inspects a random sample of 40 CDs and finds that 2 are defective. How many CDs in the shipment are likely to be defective? Show your work.

5. Callie owns a business and wants to know if the majority of her customers are satisfied. She surveys a random sample of 25 customers, and 17 customers report being satisfied. In a second random sample of 25 customers, 12 customers report being satisfied. The results of a third and fourth survey of random samples of 25 customers finds 14 and 9 satisfied customers, respectively. Gauge the variation of the estimates by describing the sample mean absolute deviation for this data set.

6. Sally works at a frozen yogurt shop that has about 2,500 customers per week and wants to know how many people like vanilla frozen yogurt. She asks the question to 40 randomly selected customers. She repeats this process two times. Sally finds that 14 people said they like vanilla frozen yogurt in the first sample, 18 in the second, and 12 in third. What is the difference between the *highest estimate* and the lowest estimate for the number of customers per week who like vanilla frozen yogurt? Show your work.

7. There are small paper clips and large paper clips in a container of 120. Ann was asked to estimate the number of large paper clips in the container. A representative sample has 10 large paper clips and 6 small paper clips. Ann's work is shown below. Identify the mistake Ann made and determine the correct estimate for the number of small paper clips in the container. Explain your reasoning.

> There are 6 small paper clips for every 10 paper clips in the container.
>
> $$\frac{6}{10} \cdot 120 = 72$$
>
> There are about 72 small paper clips in the container.

8. A warehouse receives many shipments of phone chargers. Each shipment has 450 chargers. Tamela wants to estimate how many chargers are defective in a shipment. She selects a random sample of 90 chargers from a shipment. Tamela repeats the process with 3 other shipments. There are 3 defective chargers in the first sample, 1 in the second, 4 in the third, and 2 in the fourth.

   a. Find the estimated number of defective chargers in each shipment based on the samples. Show your work.

   b. What are the least estimate and greatest estimate in part a?

Name _____ Date _____ Class _____

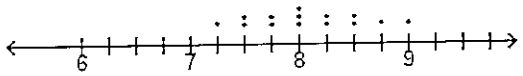
7.SP.3

SELECTED RESPONSE

Select the correct answer.

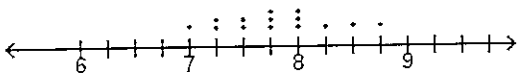
1. A middle school girls' soccer coach records the time, in minutes, for each player on the seventh grade team and the eighth grade team to run one mile. The dot plots below show the results. Which of the following statements *best* compares the median times for the two teams?

   Seventh grade team:



Minutes

   Eighth grade team:



Minutes

   (A) The median time for the seventh grade players is less than the median time for the eighth grade players, but the difference is small compared to the ranges of the data sets.

   (B) The median time for the seventh grade players is less than the median time for the eighth grade players, and the difference is large compared to the ranges of the data sets.

   (C) The median time for the eighth grade players is less than the median time for the seventh grade players, but the difference is small compared to the ranges of the data sets.

   (D) The median time for the eighth grade players is less than the median time for the seventh grade players, and the difference is large compared to the ranges of the data sets.

Select all correct answers.

2. The dot plot shows the heights, in inches, of the members of a school's swimming team.

Height (inches)

   The shapes of the distributions of the heights for the teams described below are similar to the shape of the distribution of the heights for the swimming team. For which of the distributions do fewer than half of the data values overlap with the distribution of the swimming team data?

   (A) Soccer: Low of 60 inches, a median of 64 inches, and a high of 68 inches

   (B) Gymnastics: Low of 57 inches, a median of 61 inches, and a high of 65 inches

   (C) Basketball: Low of 66 inches, a median of 70 inches, and a high of 74 inches

   (D) Volleyball: Low of 61 inches, a median of 65 inches, and a high of 69 inches

   (E) Football: Low of 64 inches, a median of 68 inches, and a high of 72 inches

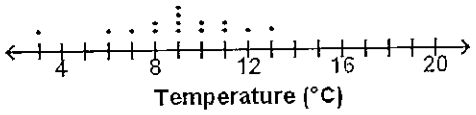
CONSTRUCTED RESPONSE

3. Melanie logs the number of pages she reads each day. The mean number of pages Melanie read per day last year is 45.9, and the mean number of pages Melanie read this year is 58.9. The mean absolute deviation for both years is about 2.05. Express the distance between the means as a multiple of the mean absolute deviation. Round your answer to the nearest hundredth.

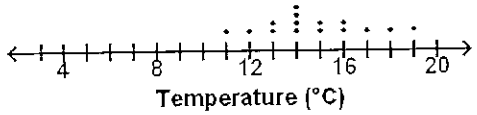
Name _____ Date _____ Class _____

4. The dot plots show the high temperatures, in degrees Celsius, of two cities for the past 15 days. Do more than half of the data points from the two cities overlap? Use the number of data points that overlap to justify your answer.

City A:



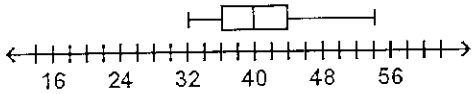
City B:



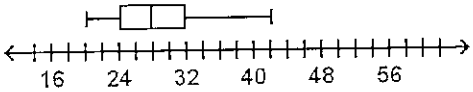
_____

5. The box plots show the amount of time, in minutes, it takes for Liam and Sandra to travel to work from their homes each morning over a period of time.

Liam:



Sandra:



a. What is the median of each data set?

_____

b. What is the interquartile range of each data set?

_____

_____

c. Express the distance between the medians as a multiple of the greater interquartile range. Show your work.

_____

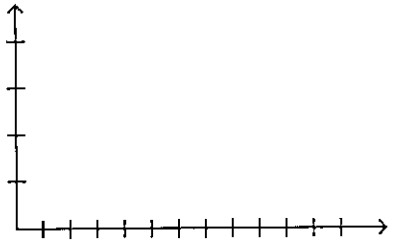
_____

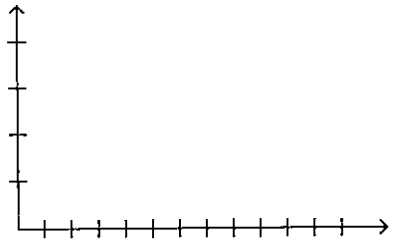
6. There is a festival of short films in Ian's town. To compare the lengths, in minutes, of the comedies and the dramas playing at the film festival, Ian records the lengths of 12 films in each genre, as shown.

Drama: 31, 33, 32, 33, 32, 30, 32, 31, 30, 32, 29, 34

Comedy: 27, 24, 26, 27, 28, 25, 29, 26, 28, 26, 26, 25

a. Make a histogram for each genre of film.





b. Do the histograms display a noticeable difference between the distributions? Explain by comparing the shapes of the distributions and describing the overlap.

_____

_____

c. Find the median and the interquartile range for each data set. Then express the difference between the medians as a multiple of the greater interquartile range.

_____

_____

Name _____ Date _____ Class _____

7.SP.4

SELECTED RESPONSE

Select the correct answer.

1. Evelyn is comparing the number of customers in the hardware store and the number of customers in the hobby store. She counts the number of customers in each store at 6 randomly selected times. The results are shown. What can Evelyn say about the numbers of customers in each store? Use stacked box plots to compare the samples.

   Hardware store: 5, 11, 9, 13, 11, 12

   Hobby store: 7, 12, 6, 4, 8, 7

   (A) Because the median number of customers in the sample for the hardware store is greater than the median of the sample for the hobby store and the sample distributions have little overlap, it is unlikely that the median numbers of customers in the stores are the same.

   (B) The median number of customers in the sample for the hardware store is greater than the median of the sample for the hobby store, but the sample distributions have considerable overlap. So, it is not unlikely that the median numbers of customers in the stores are the same.

   (C) The median number of customers in the sample for the hardware store is less than the median of the sample for the hobby store, but the sample distributions have considerable overlap. So, it is not unlikely that the median numbers of customers in the stores are the same.

   (D) Because the median number of customers in the sample for the hardware store is less than the median of the sample for the hobby store and the sample distributions have little overlap, it is unlikely that the median numbers of customers in the stores are the same.

Select all correct answers.

2. Stephen is the produce manager at a supermarket and is comparing the number of avocados sold per day to the number of cucumbers sold per day. He takes a random sample of 26 days and displays the results as shown. Which of the following statements describe the sets of data accurately?

   Sample mean number of avocados sold per day: 147

   Sample mean absolute deviation for number of avocados sold per day: 18

   Sample mean number of cucumbers sold per day: 143

   Sample mean absolute deviation for number of cucumbers sold per day: 22

   (A) The sample mean number of avocados sold per day is greater than the sample mean number of cucumbers sold per day.

   (B) The sample mean number of avocados sold per day is less than the sample mean number of cucumbers sold per day, but the means are about the same.

   (C) There is little overlap between the sample distributions for the number of avocados sold per day and the number of cucumbers sold per day.

   (D) There is considerable overlap between the sample distributions for the number of avocados sold per day and the number of cucumbers sold per day.

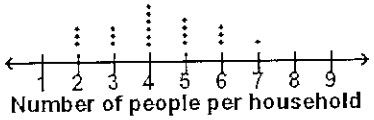
   (E) There is not strong evidence that the mean number of avocados sold per day is different than the mean number of cucumbers sold per day.

   (F) It is likely that the mean number of avocados sold per day is different than the mean number of cucumbers sold per day.

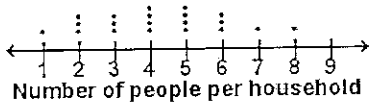
Name _____ Date _____ Class _____

CONSTRUCTED RESPONSE

3. Deanna is comparing the number of people per household in two neighborhoods. She takes a random sample of 20 households from each neighborhood and displays her results on the dot plots shown. Does this provide evidence that the mean number of people per household on School Street and on Main Street are different? Use the overlap of the dot plots to explain your answer.



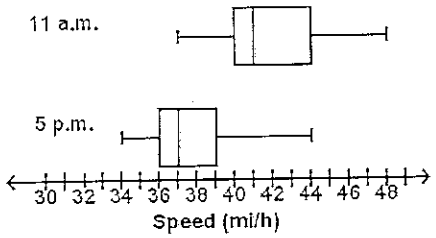
Number of people per household
School Street



Number of people per household
Main Street

_____

4. Courtney compares the speed, in miles per hour, of cars traveling on a road at 11 a.m. and 5 p.m. She takes a random sample of 50 cars from each time and displays the results on the stacked box plots as shown.



Does this provide evidence that the median speed of the cars traveling at 11 a.m. is faster than the median speed of the cars traveling at 5 p.m? Use the overlap of the intervals from the lower quartile to the upper quartile to justify your answer.

_____

5. Kendall is comparing the amount of time it takes, in minutes, for his bus ride to school in the morning and for his bus ride from school in the afternoon. He takes a random sample of 12 different days for both times and lists the results as shown.

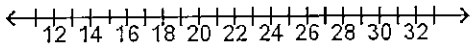
Morning:

17, 21, 16, 19, 22, 18, 23, 19, 21, 20, 18, 20

Afternoon:

25, 22, 27, 24, 26, 32, 25, 26, 24, 31, 23, 29

a. Use the data to draw a stacked box plot. Show your work.



_____

_____

b. Is the information from the samples sufficient evidence to support the idea that the bus times are longer during one part of the day than the other? Compare the box plots to explain.

_____

_____

_____

c. Describe two possible reasons why the bus ride during one part of the day is longer for Kendall on average than the other.

_____

_____

_____

Name _____ Date _____ Class _____

7.SP.5

SELECTED RESPONSE

Match the chance event with the description of the probability of the event.

A 0
B Close to 0
C $\frac{1}{2}$
D Close to 1
E 1

____ 1. A spinner with 8 equal sections labeled 1 through 8 landing on a number less than 9

____ 2. Flipping a fair coin and having the coin land with the tails side facing up

____ 3. Picking a green ball from a bag containing 99 green balls and 1 red ball

____ 4. Rolling a number greater than 6 on a number cube with sides numbered 1 through 6

____ 5. Picking the 4 of hearts from a standard deck of playing cards

Select the correct answer.

6. A game show has a contestant pick one of five doors to reveal the prize the contestant wins. A photo of a new car is behind one of the doors and gag prizes are behind the others. Which statement best describes the probability of winning the new car?

   (A) 0
   (B) Closer to 0 than to 1
   (C) Closer to 1 than to 0
   (D) 1

7. Which event is most likely to occur?

   (A) An event with probability 0.1
   (B) An event with probability 0.3
   (C) An event with probability 0.5
   (D) An event with probability 0.7

Select all correct answers.

8. Which of the following cannot be the probability of a chance event?

   (A) –0.1
   (B) 0
   (C) 0.5
   (D) 1
   (E) 1.1

9. Which of the following chance events have probabilities of occurring that are $\frac{1}{2}$?

   (A) Rolling a 1 on a fair number cube with sides numbered 1 through 6
   (B) Rolling an odd number on a fair number cube with sides numbered 1 through 6
   (C) A spinner with 4 equal sections labeled 1, 2, 3, and 4 landing on 1 or 4
   (D) A spinner with 4 equal sections labeled 1, 2, 3, and 4 landing on a number less than 5
   (E) Flipping a fair coin and having the coin land with the heads side facing up
   (F) Flipping a fair coin and having the coin land with the tails side facing up

CONSTRUCTED RESPONSE

10. Describe a chance event that has a probability of 0 and a chance event that has a probability of 1.

_____

_____

Name _____ Date _____ Class _____

11. Amanda claims that the probability of winning a game is 1.5. Describe the range of possible values for the probability of winning the game and explain why Amanda's claim must be incorrect.

12. A card is randomly selected from a standard deck.
    a. Describe an outcome that has a probability close to 0.
    b. Describe an outcome that has a probability of 0.5.
    c. Describe an outcome that has a probability close to 1.

13. A bag contains 20 blue marbles, 20 white marbles, and 1 red marble. Kendra incorrectly claims that the probability of randomly picking the red marble from the bag is close to 1.
    a. Explain why Kendra's claim is incorrect.
    b. Is the probability of randomly picking a blue marble from the bag greater than $\frac{1}{2}$, exactly $\frac{1}{2}$, or less than $\frac{1}{2}$? Explain your reasoning.

14. A hat contains yellow, green, and blue plastic discs. If a disc is selected at random from the hat, the probability it is yellow is 0.2, the probability it is green is 0.3, and the probability it is blue is 0.5.
    a. Which color disc is most likely to be selected? Explain.
    b. Which color disc is least likely to be selected? Explain.
    c. Describe two events that are equally likely to occur. Explain your reasoning.

15. Place the events described below in order of increasing likelihood. Then classify the probability of each event as being 0, between 0 and 0.5, 0.5, between 0.5 and 1, or 1.

    Event *A* is flipping a fair coin and the coin lands with the tails side facing up.

    Event *B* is a spinner with 8 equal sections numbered 1 to 8 landing on a number greater than 1.

    Event *C* is a spinner with 10 equal sections numbered 1 to 10 landing on 5.

    Event *D* is rolling a number greater than 0 on a number cube with sides numbered from 1 to 6.

    Event *E* is rolling a 0 on a number cube with sides numbers from 1 to 6.

Name _____ Date _____ Class _____

7.SP.6

SELECTED RESPONSE

Select the correct answer.

1. A hat contains cards with different colors. Annabella randomly selects a card from the hat and returns the card to the hat after noting the color. After randomly selecting a card 30 times, she picked a purple card 7 times. What would you estimate is the probability of Annabella randomly selecting a purple card based on her results?

   (A) $\frac{7}{37}$ (C) $\frac{7}{23}$

   (B) $\frac{7}{30}$ (D) $\frac{23}{30}$

2. A spinner is divided into 4 sections using the colors red, orange, green, and blue. After 50 trials, the spinner landed on red 10 times, on orange 16 times, on green 6 times, and on blue 18 times. What would you estimate as the probability of the spinner not landing on green?

   (A) $\frac{3}{25}$ (C) $\frac{17}{25}$

   (B) $\frac{1}{5}$ (D) $\frac{22}{25}$

3. Alice makes 32 of her 40 free throws during practice. Which teammate has a higher probability of making a free throw during practice?

   (A) Blythe made 27 out of 36 free throws.

   (B) Dawn made 45 out of 50 free throws.

   (C) Fay made 21 out of 30 free throws.

   (D) Gillian made 14 out of 25 free throws.

Select all correct answers.

4. A jar has 5 different colors of table tennis balls. After randomly selecting a table tennis ball, each person notes the color and places the table tennis ball back into the jar. For which of the following situations would you estimate the relative frequency to be greater than 0.3?

   (A) Anita selects a red table tennis ball 2 times after 25 attempts.

   (B) Bob selects an orange table tennis ball 10 times after 30 attempts.

   (C) Chase selects a yellow table tennis ball 12 times after 60 attempts.

   (D) Darlene selects a green table tennis ball 6 times after 15 attempts.

   (E) Felix selects a blue table tennis ball 1 time after 20 attempts.

Match the situation to the relative frequency expressed as a fraction.

____ 5. Reggie shoots 50 free throws and makes 36 of them.

____ 6. Clark throws a ball at a can 80 times and knocks over the can 30 times.

____ 7. Fran randomly selects a fruit from a bag, notes what fruit she picked, and returns it to the bag after each trial. After 40 trials, she picked an orange 5 times.

____ 8. Harley asks the question "What is your favorite season?" to 75 people and 45 responded with summer.

A $\frac{1}{8}$

B $\frac{3}{8}$

C $\frac{2}{5}$

D $\frac{3}{5}$

E $\frac{18}{25}$

F $\frac{7}{8}$

Name _____ Date _____ Class _____

CONSTRUCTED RESPONSE

9. The probability of rolling a 3 on a number cube is $\frac{1}{6}$.

   a. About how many times would you expect to roll a 3 if you roll a number cube 150 times? Show your work.

   _____

   _____

   b. Do you expect to roll a 3 exactly as many times as the answer from part a? Explain.

   _____

   _____

10. Two soccer teams compete in different leagues. After 25 of its games this season, team A won 17 games. After 30 of its games this season, team B won 18 games. Which team has a higher probability of winning its next game? Explain using relative frequencies.

    _____

    _____

    _____

11. Hermione kicks a soccer ball 40 feet away from the goal. After 18 trials, she kicks the ball inside the goal 18 times and misses the goal 0 times.

    a. What is the relative frequency of Hermione kicking the soccer ball inside the goal?

    _____

    b. Will Hermione kicking the ball into the goal definitely happen on the next trial? Explain.

    _____

    _____

12. Brendan flips a coin and records how many times it lands on the floor heads up. During the first 40 trials, it lands heads up 24 times, during the next 40 trials, it lands heads up 14 times, and during the next 120 trials, it lands heads up 64 times.

    a. Give the relative frequencies of the coin landing heads up during the first 40 trials, the next 40 trials, and the next 120 trials. Round your answers to three decimals places as needed.

    _____

    b. Give the relative frequency of the coin landing heads up during the first 80 trials. Show your work.

    _____

    c. Give the relative frequency of the coin landing heads up for all 200 trials. Show your work.

    _____

    d. What do you notice about how the number of trials affects the relative frequency?

    _____

    _____

13. Dean has different colored blocks in a container. Dean randomly selects a block, notes the color, and returns the block into the container. After 200 trials, he selected 63 yellow blocks. Jeanne uses the same process, and after 100 trials, she selected 27 yellow blocks. When asked to predict about how many yellow blocks they would expect to select if they had time to do 500 trials, what do you think Dean and Jeanne would answer? Explain why their predictions might be different.

    _____

    _____

    _____

Name _____ Date _____ Class _____

7.SP.7a

SELECTED RESPONSE

A card is randomly selected from a standard deck of 52 playing cards. Match each event with its probability.

____ 1. Randomly selecting a red card

____ 2. Randomly selecting the 6 of diamonds

____ 3. Randomly selecting a 7, 8, 9, or 10

____ 4. Randomly selecting a card that is not a king

A $\frac{1}{52}$

B $\frac{1}{4}$

C $\frac{4}{13}$

D $\frac{1}{2}$

E $\frac{3}{4}$

F $\frac{12}{13}$

Select the correct answer.

5. What is the probability of rolling a number that is greater than 4 on a number cube?

   (A) $\frac{1}{6}$ (C) $\frac{1}{2}$

   (B) $\frac{1}{3}$ (D) $\frac{2}{3}$

6. Consider a set of cards where each card is printed with a letter of the English alphabet. Each letter in the alphabet has its own card. The cards are placed into a hat. What is the probability of randomly selecting a card that is printed with a vowel (a, e, i, o, u)?

   (A) $\frac{1}{26}$ (C) $\frac{21}{26}$

   (B) $\frac{5}{26}$ (D) 1

7. A role-playing game die has 12 faces numbered 1 through 12. Each face is equally likely to appear on top after a roll. Which of the following events has a probability that is less than the probability of rolling a prime number?

   (A) The probability of rolling an even number

   (B) The probability of rolling an odd number

   (C) The probability of rolling a multiple of 3

   (D) The probability of rolling a number greater than 2

Select all correct answers.

8. There are 200 different pieces of fruit in a barrel. There are 42 apples, 82 oranges, and 76 pears. Which of the following events have a probability that is greater than 0.4?

   (A) Randomly selecting an apple

   (B) Randomly selecting an orange

   (C) Randomly selecting a pear

   (D) Randomly selecting an apple or an orange

   (E) Randomly selecting an apple or a pear

   (F) Randomly selecting an orange or a pear

CONSTRUCTED RESPONSE

9. Paige is a student in Mrs. Harding's class, where there are 10 boys and 14 girls. Mrs. Harding is randomly selecting a student to do this week's presentation.

   a. What is the probability that Paige will be selected to do this week's presentation? Show your work.

   _____

   _____

   b. What is the probability that a girl will be selected?

   _____

   _____

Name _____ Date _____ Class _____

10. A spinner has 36 equal sections numbered from 1 to 36. Develop a probability model for all of the outcomes of the spinner. Then find the probability of the spinner landing on a number greater than 20.

11. A spinner is divided into 12 equal sections, where 5 of the sections are red, 3 are blue, 2 are orange, and 2 are green.

    a. Develop a probability model for the outcomes of the spinner.

    b. What are the frequencies that you can expect for each color if you spin the spinner 60 times?

    c. Suppose you spun the spinner 60 times and it landed on red 24 times, on blue 16 times, on orange 8 times, and on green 12 times. Compare the expected frequencies found in the part b and the observed frequencies. Provide a reason for any discrepancy.

12. Lyn has four different types of marbles and keeps them in a container. She has 50 marbles with a solid color, 32 with stripes, 24 with polka dots, and 14 with stars. Lyn claims that since each marble is equally likely to be randomly selected, the probability of randomly selecting a marble with a solid color is $\frac{1}{4}$. Identify Lyn's error. Then find the probability of randomly selecting each type of marble.

13. Loretta rolled a number cube she presumed is fair, recorded the number that she rolled, and repeated the process so that she had 48 trials. The results are shown in the table below.

Number	Frequency
1	2
2	4
3	24
4	7
5	6
6	5

Describe a probability model to find the expected frequencies for each outcome based on a fair number cube, and then compare the expected frequencies to the observed frequencies. Determine if there are any discrepancies between the expected frequencies and Loretta's results. If there are any, provide one reason to explain the discrepancies.

Name _____ Date _____ Class _____

7.SP.7b

SELECTED RESPONSE

Select the correct answer.

1. An unfair coin is tossed 20 times. It lands heads up 14 times and lands tails up 6 times. What is the experimental probability for each outcome based on these results?

   (A) $P(\text{heads}) = \frac{3}{10}$; $P(\text{tails}) = \frac{7}{10}$

   (B) $P(\text{heads}) = \frac{1}{2}$; $P(\text{tails}) = \frac{1}{2}$

   (C) $P(\text{heads}) = \frac{7}{10}$; $P(\text{tails}) = \frac{3}{10}$

   (D) $P(\text{heads}) = \frac{7}{3}$; $P(\text{tails}) = \frac{3}{7}$

2. Marley tosses a paper cup 30 times and observes how it lands. After 30 trials, the paper cup lands open-end up 2 times, open-end down 3 times, and on its side 25 times. Which of the following are the experimental probabilities of the events based on Marley's observations?

   (A) $P(\text{up}) = \frac{3}{25}$; $P(\text{down}) = \frac{2}{25}$; $P(\text{side}) = 1$

   (B) $P(\text{up}) = \frac{2}{25}$; $P(\text{down}) = \frac{3}{25}$; $P(\text{side}) = 1$

   (C) $P(\text{up}) = \frac{1}{15}$; $P(\text{down}) = \frac{1}{10}$; $P(\text{side}) = \frac{5}{6}$

   (D) $P(\text{up}) = \frac{1}{30}$; $P(\text{down}) = \frac{1}{30}$; $P(\text{side}) = \frac{5}{6}$

3. Jimmie selects a marble from a bag, notes the color, and returns the marble to the bag. After 40 trials, he selects 12 orange marbles, 18 green marbles, and 10 blue marbles. Which of the following experimental probabilities are correct based on the results?

   (A) $P(\text{not orange}) = \frac{3}{10}$; $P(\text{not green}) = \frac{9}{20}$; $P(\text{not blue}) = \frac{1}{4}$

   (B) $P(\text{not orange}) = \frac{3}{7}$; $P(\text{not green}) = \frac{9}{11}$; $P(\text{not blue}) = \frac{1}{3}$

   (C) $P(\text{not orange}) = \frac{7}{10}$; $P(\text{not green}) = \frac{11}{20}$; $P(\text{not blue}) = \frac{3}{4}$

   (D) $P(\text{not orange}) = \frac{7}{3}$; $P(\text{not green}) = \frac{11}{9}$; $P(\text{not blue}) = 3$

Select all correct answers.

4. Magglio is watching a bicycle day celebration, and he records the types of bikes as they pass. Among the first 28 bicycles, Magglio counts 8 hybrid bicycles, 14 road bicycles, and 6 cruiser bicycles. Which of the following experimental probabilities are correct based on the observations?

   (A) $P(\text{hybrid}) = \frac{2}{7}$

   (B) $P(\text{hybrid}) = \frac{5}{7}$

   (C) $P(\text{road}) = \frac{1}{2}$

   (D) $P(\text{road}) = \frac{8}{14}$

   (E) $P(\text{cruiser}) = \frac{11}{14}$

   (F) $P(\text{cruiser}) = \frac{3}{14}$

Name _____ Date _____ Class _____

CONSTRUCTED RESPONSE

5. A spinner has 4 unequal sections and is spun 45 times. The spinner landed on red 15 times, on orange 6 times, on yellow 3 times, and on green 21 times. Based on these results, find the approximate probability of landing on each of the sections. Explain.

6. Marissa selects a card in a hat, notes which color it is, and returns the card to the hat and repeats. After 70 trials, she finds that 12 of the cards are red, 38 are green, and 20 are purple.
   a. What are the experimental probabilities of drawing each color, based on these results?
   b. What is the sum of the probabilities from part a? Does this make sense? Explain.

7. Adrian is throwing a ball into a pail. After 50 attempts, the ball goes into the pail and stays 8 times, goes into the pail and bounces out 6 times, and misses the pail 36 times. Use these results to make a prediction about the approximate probability of each outcome if Adrian throws the ball again.

8. Aimee asked randomly selected students in the school "Do you like the current dress code?" Of the 80 students she asked, 25 said yes and 55 said no.
   a. What are the experimental probabilities of getting the answers yes and no, based on Aimee's results?
   b. Aimee asked another 80 randomly selected students the same question. This time, 36 said yes and 44 said no. Explain why there is a discrepancy between her first survey and her second survey.

9. The manager of an airport kept a record of an airline's arrivals for one day. Out of 80 arrivals, 18 were early, 52 were on time, and 10 were late.
   a. Do the outcomes for the arrivals appear to be equally likely based on these results? Explain by describing the probability of each event as based on the manager's record.
   b. The next day, there were 60 arrivals. 3 were early, 21 were on time, and 36 were late. Are these the numbers you would expect from the probabilities you found in part a? Explain.

Name _____ Date _____ Class _____

7.SP.8a

SELECTED RESPONSE

You roll a fair number cube, and then roll the number cube again. Match each description with the associated probability.

____ 1. The sum of the number cubes is 7.

____ 2. The sum of the number cubes is at least 9.

____ 3. The sum of the number cubes is not a prime number.

____ 4. The sum of the number cubes is less than 4.

A $\frac{1}{36}$

B $\frac{1}{12}$

C $\frac{1}{6}$

D $\frac{5}{18}$

E $\frac{5}{12}$

F $\frac{7}{12}$

Select the correct answer.

5. You randomly select a letter from the letters A, B, C, D, E and flip a coin. The table represents the sample space, where H represents the coin landing heads up and T represents landing tails up. What is the probability of selecting the letter "C" or the coin landing tails up?

	H	T
A	(A, H)	(A, T)
B	(B, H)	(B, T)
C	(C, H)	(C, T)
D	(D, H)	(D, T)
E	(E, H)	(E, T)

Ⓐ $\frac{1}{10}$

Ⓑ $\frac{1}{5}$

Ⓒ $\frac{1}{2}$

Ⓓ $\frac{3}{5}$

Select all correct answers.

6. A company assigns codes to each of its customers. The first part of the code is A, B, or C. The second part is 0 or 1, and the third part is M or F. The possible outcomes are A0M, A0F, A1M, A1F, B0M, B0F, B1M, B1F, C0M, C0F, C1M, and C1F. Which statements are true?

Ⓐ The probability of having a B or a 1 in a randomly selected code is $\frac{2}{3}$.

Ⓑ The probability of having a 0 or an M in a randomly selected code is $\frac{2}{3}$.

Ⓒ The probability of having a C or not having an F in a randomly selected code is $\frac{1}{6}$.

Ⓓ The probability of having an A and not having an M in a randomly selected code is $\frac{1}{6}$.

Ⓔ The probability of having a 0 and not having a 1 in a randomly selected code is 1.

Name _____ Date _____ Class _____

CONSTRUCTED RESPONSE

7. Ricardo has three suit jackets: black, green, and white. He also has three shirts: white, black, and blue. What is the probability of Ricardo randomly selecting a suit jacket and a shirt that are the same color? Explain.

_____

8. Fay is a tourist in a city and wants to go on a boat tour and a bus tour. There are 3 boat tours (1, 2, and 3) and 4 bus tours (A, B, C, and D). The sample space is shown in the table.

	A	B	C	D
1	(1, A)	(1, B)	(1, C)	(1, D)
2	(2, A)	(2, B)	(2, C)	(2, D)
3	(3, A)	(3, B)	(3, C)	(3, D)

What is the probability of Fay randomly selecting boat tour 1 or bus tour B? Explain.

_____

9. A coin is flipped three times. The coin can land heads up (H) or tails up (T).

   a. Write the sample space in the format (first flip, second flip, third flip).

   _____

   b. What is the probability of the coin landing heads up on the first flip and tails up on the second flip? Explain using the sample space.

   _____

   c. What is the probability of all three flips landing heads up or exactly one flip landing heads up? Explain using the sample space.

   _____

   d. What is the probability of at most two flips landing tails up? Explain using the sample space.

   _____

10. In a role-playing game, two special dice are rolled. One has 4 faces numbered 1 through 4, and one has 6 faces numbered 1 through 6.

    a. Write the sample space in the format (4-faced die, 6-faced die).

    _____

    _____

    _____

    b. What is the probability that the total of the two rolls is greater than or equal to 8? Explain.

    _____

11. Three boys, Adam, Kyle, and Ty, and two girls, Anne and Kate, have volunteered to help plan the school dance. One student will be randomly selected to plan and host the event, while another will be randomly selected to manage all of the scheduled activities. The remaining volunteers will help decorate the gym for the dance.

    a. Draw a tree diagram that represents the sample space of who is selected as the host and who is selected as the manager.

    b. What is the probability that a girl will host the event and Anne will manage the event? Explain.

    _____

    c. What is the probability that a boy will host the event or a girl will manage the event? Explain.

    _____

    d. What is the probability that Adam, Kyle, and Ty will decorate the gym? Explain.

    _____

Name _____ Date _____ Class _____

7.SP.8b

SELECTED RESPONSE

A 12-sided role-playing game die is rolled twice. Match the event with the outcomes in the format (first roll, second roll).

____ 1. Rolling double 9s

____ 2. Rolling a 6 and rolling a 10, in either order

____ 3. Rolling a 12 and rolling a 4, in either order

____ 4. Rolling a 2, and then rolling an 11

A (4, 12), (12, 4)
B (6, 10)
C (2, 11), (11, 2)
D (9, 9)
E (12, 4)
F (6, 10), (10, 6)
G (11, 2)
H (2, 11)

Select the correct answer.

5. A coin is flipped two times. Identify the sample space of the compound event where H represents the coin landing heads up and T represents the coin landing tails up.

   (A) (H, H), (H, T), (T, T)
   (B) H, T
   (C) (H, H), (H, T), (T, H), (T, T)
   (D) (H, T)

6. An employee of a company gets a three-digit lock code to enter the building. The digits could be 1, 5, or 7. Identify the lock codes in the sample space that have at least two fives.

   (A) 155, 551, 555, 557, 755
   (B) 155, 515, 551, 557, 575, 755
   (C) 155, 515, 551, 555, 557, 575, 755
   (D) 115, 151, 155, 157, 175, 511, 515, 517, 551, 555, 557, 571, 575, 577, 715, 751, 755, 757, 775

7. Each of the five cards in a set are labeled with a vowel, where the vowels are A, E, I, O, and U. Sean chooses a card at random, and then Lupe chooses a card at random. What are the outcomes where the card labeled "E" is selected? Use the format (Sean's card, Lupe's card).

   (A) (E, A), (E, I), (E, O), (E, U)
   (B) (A, E), (I, E), (O, E), (U, E)
   (C) (E, A), (E, I), (E, O), (E, U), (A, E), (I, E), (O, E), (U, E)
   (D) (E, E)

8. A pizza stand at a movie theater has a choice of three toppings, onion (O), mushroom (M), and pepperoni (P). Nina and Russ are sharing a pizza and each of them chooses one topping. Is the sample space for the topping combinations (O, M), (O, P), (M, O), (M, P), (P, O), and (P, M)? Explain.

   (A) Yes; all of the possible outcomes are shown.
   (B) No; the possible outcomes (O, O), (M, M), and (P, P) are not shown.
   (C) No; the only possible outcomes are (O, O), (M, M), and (P, P).
   (D) No; the outcomes (O, M) and (M, O) are not possible.

Select all correct answers.

9. The students in Mr. Chen's English class are seeing a play. The tickets are for rows D through F, seats 1 through 8. Mr. Chen randomly chooses a row letter and seat number to assign a seat to each student. When Quentin's name is called, he notes that his row letter is a vowel and his seat number is prime. Which of the following could be Quentin's seat assignment?

   (A) D4
   (B) E1
   (C) E2
   (D) E3
   (E) E5
   (F) E7
   (G) F3
   (H) F7

Name _____ Date _____ Class _____

CONSTRUCTED RESPONSE

10. Ilana needs to go to an office supply store and an electronics store. There are 4 electronics stores (E1, E2, E3, E4) and 3 office supply stores (S1, S2, S3) in her area. Represent the sample space as a table using the format (electronics store, office supply store). Then, use the table to find outcomes where Ilana goes to office supply store S2 or electronics store E3.

	S1	S2	S3
E1			
E2			
E3			
E4			

11. A board game has 5 different pieces players can choose, a boat, a car, a top hat, a shoe, and a dog. Fatima randomly selects one of the pieces, and then Joey randomly selects one of the remaining pieces.

    a. Determine all the possible outcomes.

    b. What is the probability that neither Fatima nor Joey has the top hat? Explain.

12. Hannah has a choice of three kinds of pancakes: buttermilk (B), chocolate chip (C), and banana (A). She has a choice of three toppings: raspberries (R), blueberries (Y), and strawberries (S).

    a. Write the sample space in the format (pancake, topping).

    b. Identify the outcomes that have buttermilk pancakes or blueberry toppings.

13. Hope rolls two fair number cubes at the same time and finds the product of the numbers that land facing up.

    a. Complete the table showing the products for the outcomes.

	1	2	3	4	5	6
1	1					
2						
3					15	
4		8				
5						
6						36

    b. List the outcomes that result in a product of at least 24. Use the format (1st number, 2nd number).

    c. What is the probability of Hope getting an outcome that is at least 24? Explain.

14. A food truck offers a lunch special. Customers have a choice of a sandwich (ham, turkey, veggie), a side (chips, pretzels), and a drink (soda, juice).

    a. Construct a tree diagram to represent all of the possible outcomes.

    b. Use the tree diagram from part a to determine the number of possible outcomes in the sample space.

    c. What is the probability of a customer randomly choosing a combination package that has pretzels and juice? Explain.

Name _____ Date _____ Class _____

7.SP.8c

SELECTED RESPONSE

Match each situation with the best stimulation method. An answer choice may be used more than once.

____ 1. A manager of a restaurant knows that about 40% of customers order at least one appetizer. What is the probability that exactly 2 of the next 5 customers order at least one appetizer?

____ 2. A contestant on a game show has a 1 in 6 chance of winning for each try. If the contestant has 2 tries, what is the probability that she does not win?

____ 3. The weather forecast states there is a 25% chance of rain for each of the next 7 days. What is the probability that it will rain on at least one of those days?

____ 4. A florist know that about 75% of her flower bulbs grow into flowers. What is the probability that at least 30 of her 60 bulbs grow into flowers?

A A fair coin
B A fair number cube
C A spinner with 7 equal sections
D A set of chips where $\frac{3}{5}$ of the chips are red and the rest are black
E A spinner with 4 equal sections

Select the correct answer.

5. Tori is simulating a mother having 3 children. Since the probability of having a boy is about the same as the probability of having a girl, she flips a fair coin, with the coin landing heads up (H) representing a boy and the coin landing tails up (T) representing a girl. Based on the 14 trials shown in the table, what is an approximation of the probability of a mother having exactly 2 girls if she has 3 children?

Trial	Result
1	H, H, T
2	T, H, T
3	H, H, H
4	T, T, T
5	T, H, T
6	H, H, T
7	H, T, T

Trial	Result
8	T, H, T
9	H, T, T
10	H, H, H
11	T, H, H
12	H, H, T
13	T, T, H
14	T, H, H

Ⓐ $\frac{6}{14}$ Ⓒ $\frac{6}{8}$

Ⓑ $\frac{7}{14}$ Ⓓ $\frac{12}{14}$

Select all correct answers.

6. A manager of a manufacturing plant knows that about 1% of the products made are defective and wants to use a simulation to estimate the probability of getting a defective product from the next 100 items randomly selected. Which of the following methods can be used?

Ⓐ No simulation method is needed. The probability of getting a defective product when randomly selecting 100 items is exactly 1 if 1% of the products are defective.

Ⓑ Use numbers from 1 through 100 where 1 represents a working product and the numbers 2 through 100 represent a defective product.

Ⓒ Use numbers from 1 through 100 where 1 represents a defective product and the numbers 2 through 100 represent a working product.

Ⓓ Use numbers from 1 through 200 where the numbers 19 and 20 represent a defective product and the numbers 1 through 18 and 21 through 200 represent a working product.

Name _____ Date _____ Class _____

CONSTRUCTED RESPONSE

7. A poll shows that about 76% of the residents of a city are opposed to a new law and 24% are in favor. A local talk radio station plans to have audience members call to offer their opinions on the new law. To better anticipate the flow of the discussion, the host uses a random number generator and the poll results to simulate the first 3 callers.

   a. The host uses random numbers from 1 to 50 to simulate callers' opinions on the issue. If the numbers 1 through N represent a caller who is in favor of the new law and the numbers $N + 1$ through 50 represent a caller who is opposed to it, what is the value of N? Explain.

   _____

   _____

   _____

   b. The table shows the results of 14 simulations of 3 callers.

   Using the number assignments from part a and the results of the simulations, what is the experimental probability that exactly 2 of the first 3 callers oppose the new ordinance? Explain.

   _____

   _____

   _____

Trial	Numbers
1	47, 4, 28
2	42, 40, 19
3	6, 29, 3
4	20, 35, 41
5	6, 3, 16
6	39, 8, 37
7	44, 1, 33

Trial	Numbers
8	22, 25, 3
9	29, 28, 36
10	15, 4, 49
11	11, 3, 23
12	30, 43, 33
13	42, 28, 13
14	7, 27, 21

8. Mickey runs a restaurant. About 45% of his customers pay with cash and the rest pay with a credit or debit card. Suppose Mickey wants to use a random number generator to simulate the payment method used by the next 5 customers.

   a. If the generator produces numbers 1 through 20, how many numbers should be used to represent a customer paying with cash? Explain.

   _____

   _____

   b. Assign random numbers to represent customers paying with cash and to represent customers paying with a credit or debit card.

   _____

   _____

   c. The table shows the results for 10 trials of 5 numbers.

Trial	Numbers
1	5, 7, 14, 6, 3
2	5, 9, 7, 7, 16
3	3, 9, 16, 3, 6
4	10, 20, 7, 6, 19
5	8, 4, 3, 2, 19
6	13, 18, 3, 16, 14
7	10, 17, 13, 14, 10
8	14, 4, 12, 6, 19
9	3, 4, 12, 14, 3
10	13, 16, 17, 9, 18

   Using the assignments from part b and the results from the table, what does the simulation suggest is an approximation of the probability that exactly 2 of the next 5 customers pay with cash? Explain.

   _____

   _____

   _____

7.SP.1 Answers

1. C
2. D
3. B
4. a. Yes
   b. No
   c. No
   d. Yes
   e. No
5. A, D
6. No. Asking every resident in the town is time consuming and unnecessary because a representative sample can provide information about which band is preferred by the residents of the town.

   Rubric

   1 point for answer; 1 point for explanation
7. Possible answer: The president of the company could randomly select a sample of workers from all departments and ask which shift they prefer to work.

   Rubric

   2 points for a reasonable method
8. No. The sample is not representative of the entire school population because each student is not equally likely to be chosen (unless everyone in school is on the girls' lacrosse team).

   Rubric

   1 point for answer; 1 point for explanation
9. a. Possible answer: Leah's method will not produce a representative sample because it does not include students who arrive either before 7:30 a.m. or after 8:00 a.m.
   b. Possible answer: Leah could assign a different number to each student at the school and then randomly pick numbers to get a representative sample.

   Rubric

   a. 1 point

   b. 1 point
10. a. Possible answer: A random sample of 200 customers will provide a representative sample that the manager can then use to make inferences about all of the customers. This is cheaper, less time consuming, and less likely to interfere with normal business than giving the survey to every customer who walks through the door.
    b. Possible answer: Randomly selecting a customer exiting a random store at a random time during the week would provide a representative sample. Each customer has different tastes and different free time in which to shop. So, to represent the average customer, it is necessary to randomly select the customer, store, time of day, and day of the week.

    Rubric

    a. 2 points

    b. 1 point for answer;
    1 point for explanation

7.SP.2 Answers

1. B

2. B

3. a. $0 \le P < 0.1$
   b. $0 \le P < 0.1$
   c. $0.2 \le P < 0.5$
   d. $0.1 \le P < 0.2$
   e. $0 \le P < 0.1$

4. $\frac{2}{40} \cdot 6{,}000 = 300$; 300 CDs in the shipment are likely to be defective.

   Rubric
   1 point for answer;
   1 point for showing work

5. Mean:

   $\frac{17+12+14+9}{4} = \frac{52}{4} = 13$

   Mean absolute deviation:

   $\frac{4+1+1+4}{4} = \frac{10}{4} = 2.5$

   Rubric
   1 point for finding mean; 1 point for finding mean absolute deviation

6. First sample: $\frac{14}{40} \cdot 2{,}500 = 875$

   Second sample: $\frac{18}{40} \cdot 2{,}500 = 1{,}125$

   Third sample: $\frac{12}{40} \cdot 2{,}500 = 750$

   Subtract the lowest estimate from the highest estimate.

   $1{,}125 - 750 = 375$

   The difference between the highest estimate and the lowest estimate is 375.

   Rubric
   1 point for answer;
   2 points for showing work

7. Ann incorrectly stated that there are 6 small paper clips for every 10 paper clips. Since the sample is representative, there are 6 small paper clips for every $6 + 10 = 16$ paper clips in the container.

   $\frac{6}{16} \cdot 120 = 45$

   So, there are about 45 small paper clips in the container.

   Rubric
   2 points for identifying mistake;
   1 point for finding the correct estimate;
   1 point for explanation

8. a. First sample: $\frac{3}{90} \cdot 450 = 15$

   Second sample: $\frac{1}{90} \cdot 450 = 5$

   Third sample: $\frac{4}{90} \cdot 450 = 20$

   Fourth sample: $\frac{2}{90} \cdot 450 = 10$

   b. The least estimate for the number of defective chargers in a shipment is 5, and the greatest estimate for the number of defective chargers in a shipment is 20.

   Rubric
   a. 0.5 point for each estimate
   b. 1 point

7.SP.3 Answers

1. C

2. C, E

3. The difference between the means is $58.9 - 45.9 = 13$. Divide 13 by 2.05 to express the distance between the means as a multiple of the mean absolute deviation.

   $$\frac{13}{2.05} \approx 6.34$$

   The difference between the means is about 6.34 times the mean absolute deviation.

   Rubric

   1 point for difference between means;
   1 point for expressing difference as a multiple of MAD

4. No. Only 4 of the 15 data points from each data set overlap the other set. At least 8 data points from one set would have to overlap the other set for more than half of the data points to overlap.

   Rubric

   1 point for answer;
   1 point for explanation

5. a. Liam: 40 min; Sandra: 28 min

   b. Liam: 8 min; Sandra: 8 min

   c. The distance between the medians is 12 min.

   $$\frac{12}{8} = 1.5$$

   So, the distance between the medians is 1.5 times the interquartile range.

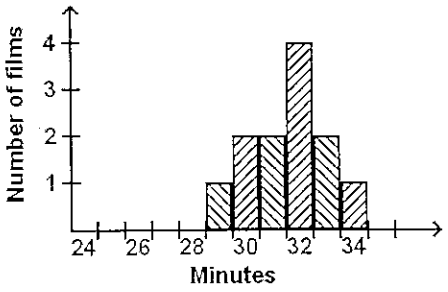
   Rubric

   a. 0.5 point for each answer

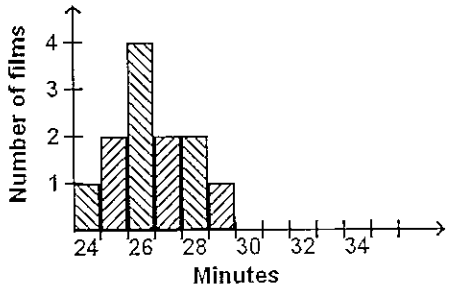
   b. 0.5 point for each answer

   c. 1 point for answer;
   1 point for showing work

6. a. Drama:



Comedy:



   b. Yes. The shapes of the distributions are about the same, but there is very little overlap; the only common value is the length 29 minutes.

   c. Drama:
   Median is 32 min; interquartile range is $32.5 - 30.5 = 2$ min.

   Comedy:
   Median is 26 min; interquartile range is $27.5 - 25.5 = 2$ min.

   The difference between the medians is $32 - 26 = 6$ minutes.

   $$\frac{32-26}{2} = \frac{6}{2} = 3$$

   The difference between the median lengths is 3 times the interquartile range.

   Rubric

   a. 1 point for each histogram

   b. 1 point for answer;
   1 point for explanation

   c. 0.5 point for finding each median;
   0.5 point for finding each IQR;
   1 point for expressing the difference between the medians as a multiple of the IQR

7.SP.4 Answers

1. A
2. A, D, E
3. No. There is a large area of overlap between the sample dot plot for School Street and the sample dot plot for Main Street. It is not unlikely that the means are the same.

   Rubric
   1 point for answer;
   2 points for explanation
4. Yes. The interval from the lower quartile to the upper quartile for the cars traveling at 11 a.m. is 40 mi/h to 44 mi/h and the interval for the cars traveling at 5 p.m. is 36 mi/h to 39 mi/h. Since the intervals from the lower quartile to the upper quartile do not overlap, it is not unlikely that the median speed of the cars traveling at 11 a.m. is faster than the median speed of the cars traveling at 5 p.m.

   Rubric
   1 point for answer;
   2 points for justification
5. a. Median morning:

   $\frac{19+20}{2} = 19.5$ minutes

   Lower quartile morning:

   $\frac{18+18}{2} = 18$ minutes

   Upper quartile morning:

   $\frac{21+21}{2} = 21$ minutes

   Median afternoon:

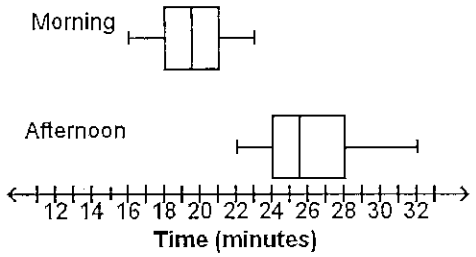
   $\frac{25+26}{2} = 25.5$ minutes

   Lower quartile afternoon:

   $\frac{24+24}{2} = 24$ minutes

   Upper quartile afternoon:

   $\frac{27+29}{2} = 28$ minutes



   b. Notice that there is no overlap of the interquartile intervals and the greatest value from the morning is less than the lower quartile value for the afternoon. It would be unlikely to have samples with such distinctness if the median bus times in the morning and the afternoon were the same. So, there is evidence to suggest that the median bus times are different.

   c. Possible answers: There could be more traffic in the afternoon than in the morning, causing the amount of time on the bus to be much longer in general. The bus route could be different in the afternoon than in the morning. Kendall could be one of the last students to be picked up by the bus in the morning and one of the last students to be dropped off from the bus in the afternoon.

   Rubric
   a. 1 point for each box plot;
   1 point for showing work
   b. 1 point for answer;
   1 point for explanation
   c. 0.5 point for each reason

7.SP.5 Answers

1. E
2. C
3. D
4. A
5. B
6. B
7. D
8. A, E
9. B, C, E, F
10. Possible answer:

    An event that has a probability of 0 is randomly picking a blue marble from a jar that has only orange marbles and red marbles.

    An event that has a probability of 1 is randomly picking a black or red card from a standard deck of cards.

    Rubric

    1 point for each description

11. The probability of an event is a number between 0 and 1, where 0 is the probability of an event that cannot occur and 1 is the probability of an event that is certain to occur. The probability of winning the game must be between 0 and 1, inclusive. Since $1.5 > 1$, the probability of winning the game cannot be 1.5.

    Rubric

    1 point for correct range; 2 points for explanation

12. Possible answers:
    a. Selecting the queen of spades has a probability close to 0.
    b. Selecting a red card has a probability of 0.5.
    c. Selecting any card except the queen of spades has a probability close to 1.

    Rubric

    1 point for each description

13. a. Picking the 1 red marble from the bag is unlikely, so the probability of this event is close to 0, not close to 1.

    b. Less than $\frac{1}{2}$. There are 20 blue marbles and 21 marbles that are not blue (20 white and 1 red). Since fewer than half the marbles are blue, the probability of picking a blue marble is less than $\frac{1}{2}$. (Accept answers that give $\frac{20}{41}$ as the exact theoretical probability.)

    Rubric

    a. 1 point
    b. 1 point for answer;
    1 point for explanation

14. a. Greater probability indicates greater likelihood. Since the probability of selecting a blue disc is the greatest, selecting a blue disc is the most likely outcome.
    b. Lesser probability indicates a less likely event. Since the probability of selecting a yellow disc is the least, selecting a yellow disc is the least likely outcome.
    c. An event with a probability of occurring of about 0.5 is as likely to occur as not. Since the probability of selecting a blue disc is 0.5, the event of picking a blue disc and not picking a blue disc are equally likely. Not picking a blue disc is the same as picking a yellow or green disc, so the event of picking a blue disc and the event of picking a yellow or green disc are equally likely.

    Rubric

    a. 1 point for answer;
    1 point for explanation
    b. 1 point for answer;
    1 point for explanation
    c. 1 point for description;
    1 point for explanation

15. The events in order of increasing likelihood are E, C, A, B, and D.

Since event E is impossible, the probability is 0.

Since event C is more unlikely than likely, the probability is between 0 and 0.5.

Since event A is as likely as not, the probability is 0.5.

Since event B is more likely than unlikely, the probability is between 0.5 and 1.

Since event D is certain, the probability is 1.

Rubric

1 point for ordering the events; 1 point for the classification of each probability

7.SP.6 Answers

1. B
2. D
3. B
4. B, D
5. E
6. B
7. A
8. D

9.a.I would expect to roll a 3 about 25 times.

$$\frac{1}{6} \cdot 150 = 25$$

b. No. Probability doesn't guarantee an event will happen a certain number of times after a certain number of trials.

Rubric

a. 1 point for answer;
1 point for showing work

b. 1 point for answer;
1 point for explanation

10. Team A. The relative frequency is an approximation of the team's probability of winning its next game. Since $\frac{17}{25} = 0.68$ is the relative frequency of team A winning its games and $\frac{18}{30} = 0.6$ is the relative frequency of team B winning its games, team A has a higher probability of winning its games than team B.

Rubric

1 point for answer;
2 points for explanation

11. a. $\frac{18}{18} = 1$

b. No. Using the relative frequency as an approximation of the probability, the probability of Hermione kicking the ball into the goal is about 1. Since Hermione kicking the ball into the goal might not happen on the next trial, the probability is not exactly 1 and the relative frequency is just an approximation of the probability.

Rubric

a. 1 point for answer

b. 1 point for answer;
1 point for explanation

12. a. The relative frequency during the first 40 trials is $\frac{24}{40} = 0.6$. The relative frequency during the next 40 trials is $\frac{14}{40} = 0.35$. The relative frequency during the next 120 trials is $\frac{64}{120} \approx 0.533$.

b. The number of times the coin landed heads up during the first 80 trials is $24 + 14 = 38$. So, the relative frequency after 80 trials is $\frac{38}{80} = 0.475$.

c. The number of times the coin landed heads up after all 200 trials is $38 + 64 = 102$. So, the relative frequency after all 200 trials is $\frac{102}{200} = 0.51$.

d. Possible answers: The relative frequencies are not always the same for the same number of trials. The relative frequencies are close to 0.5 but not exactly 0.5. The relative frequency for the greatest number of trials is the one that is closest to 0.5.

Rubric

a. 2 points

b. 1 point for answer; 1 point for work

c. 1 point for answer; 1 point for work

d. 1 point for reasonable answer

13. Dean would say about 157 or 158 because in his experiment, he found a relative frequency of $\frac{63}{200}$.

$\frac{63}{200} \cdot 500 = 157.5$

Jeanne would say about 135 because in her experiment, she found a relative frequency of $\frac{27}{100}$.

$\frac{27}{100} \cdot 500 = 135$

Dean's prediction is different from Jeanne's prediction because they used relative frequencies based on different trials. Each of their relative frequencies is an approximation of the proportion of blocks in the container that are yellow. The actual proportion of blocks in the container that are yellow is not known exactly.

Rubric

1 point for each prediction;
2 points for explanation

7.SP.7a Answers

1. D
2. A
3. C
4. F
5. B
6. B
7. C
8. B, D, E, F
9. a. Since there are $10 + 14 = 24$ students in the class, there are 24 equally likely outcomes. Since the probability of each outcome is $\frac{1}{24}$, the probability that Paige will be selected is $\frac{1}{24}$.

   b. Since there are 14 girls, the probability that a girl will be selected is $14 \cdot \frac{1}{24} = \frac{14}{24} = \frac{7}{12}$.

   Rubric

   a. 1 point for answer;
   1 point for showing work

   b. 1 point for answer

10. Since there are 36 equal sections, there are 36 equally likely outcomes. So, the probability of each outcome is $\frac{1}{36}$.

    Since there are 16 numbers that are greater than 20 from 1 to 36, the probability of the spinner landing on a number greater than 20 is $16 \cdot \frac{1}{36} = \frac{16}{36} = \frac{4}{9}$.

    Rubric

    2 points for model; 1 point for probability

11. a. Since each section is the same size, each outcome is equally likely. Since there are 12 equally likely outcomes, the probability of each outcome is $\frac{1}{12}$. The probability of the spinner landing on red is $\frac{5}{12}$, the probability of the spinner landing on blue is $\frac{3}{12} = \frac{1}{4}$, the probability of the spinner landing on orange is $\frac{2}{12} = \frac{1}{6}$, and the probability of the spinner landing on green is $\frac{2}{12} = \frac{1}{6}$.

    b. You can expect the spinner to land on red $\frac{5}{12} \cdot 60 = 25$ times, land on blue $\frac{1}{4} \cdot 60 = 15$ times, land on orange $\frac{1}{6} \cdot 60 = 10$ times, and land on green $\frac{1}{6} \cdot 60 = 10$ times.

    c. The expected frequency is $25 - 24 = 1$ more than the observed frequency for red.
    The expected frequency is $16 - 15 = 1$ less than the observed frequency for blue.
    The expected frequency is $10 - 8 = 2$ more than the observed frequency for orange.
    The expected frequency is $12 - 10 = 2$ less than the observed frequency for green.

The discrepancy between the expected and observed frequencies could occur because of random variation. Sometimes the expected frequency is higher than the observed frequency, sometimes the expected frequency is lower than the observed frequency, and sometimes the expected frequency is equal to the observed frequency. There is also a possibility that the spinner areas are not exactly equal.

Rubric

a. 2 points

b. 0.5 point for each expected frequency

c. 0.5 point for each comparison; 1 point for reason

12. Lyn made the mistake thinking that if each individual marble is equally likely to be randomly selected, then the probability of selecting each type of marble is the same. However, the number of marbles of each type is not the same. So, the probability of randomly selecting each type of marble is not the same.

Since the marbles are being randomly selected, each outcome is equally likely. Since there are $50 + 32 + 24 + 14 = 120$ marbles, there are 120 equally likely outcomes and the probability of each outcome is $\frac{1}{120}$.

The probability of randomly selecting a marble with a solid color is

$$50 \cdot \frac{1}{120} = \frac{50}{120} = \frac{5}{12}.$$

The probability of randomly selecting a marble with stripes is

$$32 \cdot \frac{1}{120} = \frac{32}{120} = \frac{4}{15}.$$

The probability of randomly selecting a marble with polka dots is

$$24 \cdot \frac{1}{120} = \frac{24}{120} = \frac{1}{5}.$$

The probability of randomly selecting a marble with stars is $14 \cdot \frac{1}{120} = \frac{14}{120} = \frac{7}{60}$.

Rubric

2 points for identifying Lyn's error; 1 point for finding each of the four probabilities

13. If the number cube is fair, then each outcome is equally likely. Since there are 6 equally likely outcomes, the probability of each outcome is $\frac{1}{6}$. So, the probability of rolling a 1 is the same as the probability of rolling a 2, 3, 4, 5, or 6. So, Loretta should expect to roll each number $48 \cdot \frac{1}{6} = 8$ times.

The observed frequency is less than the expected frequency for all outcomes except for rolling a 3. The observed frequency for rolling a 3 is 3 times the expected frequency.

There is a discrepancy between the expected frequencies and Loretta's results because the observed frequency of rolling a 3 is more than 3 times the observed frequency of the second most frequent number.

Possible answer:

The discrepancy could happen because the expected frequencies are based on the assumption that the number cube is fair and the number cube Loretta used isn't fair. The number cube could be weighted to favor rolling a 3 more than rolling any other number.

Rubric

2 points for probability model; 1 point for expected frequency of each outcome; 1 point for comparison; 1 point for stating there is a discrepancy; 1 point for reasonable explanation

7.SP.7b Answers

1. C
2. C
3. C
4. A, C, F
5. Since the spinner landed on red 15 times, the approximate probability of the spinner landing on red is $\frac{15}{45}$, or $\frac{1}{3}$.

   Since the spinner landed on orange 6 times, the approximate probability of the spinner landing on orange is $\frac{6}{45}$, or $\frac{2}{15}$.

   Since the spinner landed on yellow 3 times, the approximate probability of the spinner landing on yellow is $\frac{3}{45}$, or $\frac{1}{15}$.

   Since the spinner landed on green 21 times, the approximate probability of the spinner landing on green is $\frac{21}{45}$, or $\frac{7}{15}$.

   Rubric

   0.5 point for each probability;
   1 point for explanation

6. a. $P(\text{red}) = \frac{12}{70} = \frac{6}{35}$;

   $P(\text{green}) = \frac{38}{70} = \frac{19}{35}$;

   $P(\text{purple}) = \frac{20}{70} = \frac{10}{35} = \frac{2}{7}$

   b. The sum of the probabilities is $\frac{6}{35} + \frac{19}{35} + \frac{10}{35} = \frac{35}{35} = 1$.

   Possible answer: This makes sense because the experimental probabilities are calculated by counting the frequencies of the outcomes and dividing by the number of trials. The sum of the frequencies equals the number of trials, so the sum of the experimental probabilities is a fraction with the same numerator and denominator, which equals 1.

   Rubric

   a. 0.5 point for each event
   b. 1 point for sum; 0.5 for answering that it makes sense; 1 point for explanation

7. The approximate probability that the ball goes into the pail and stays is $\frac{8}{50}$, or $\frac{4}{25}$. The approximate probability that the ball goes into the pail and bounces out is $\frac{6}{50}$, or $\frac{3}{25}$. The approximate probability that the ball misses the pail is $\frac{36}{50}$, or $\frac{18}{25}$.

   Rubric

   1 point for each probability

8. a. $P(\text{yes}) = \frac{25}{80} = \frac{5}{16}$; $P(\text{no}) = \frac{55}{80} = \frac{11}{16}$

b. Possible answer: The discrepancy could come from random variation. The same number of people are not likely to say yes or no every time 80 people are randomly selected.

Rubric

a. 1 point for each probability

b. 1 point for reasonable explanation

9. a. Since 18 out of 80 arrivals were early, the experimental probability of an arrival being early is $\frac{18}{80}$, or $\frac{9}{40}$.

Since 52 out of 80 arrivals were on time, the experimental probability of an arrival being on time is $\frac{52}{80}$, or $\frac{13}{20}$.

Since 10 out of 80 arrivals were late, the experimental probability of an arrival being late is $\frac{10}{80}$, or $\frac{1}{8}$.

These three probabilities are not equal, so it appears that the outcomes are not equally likely.

b. No. Since $\frac{9}{40} \cdot 60 = 13.5$ and $13.5 > 3$, the observed frequency is lower than expected for the number of arrivals being early.

Since $\frac{13}{20} \cdot 60 = 39$ and $39 > 21$, the observed frequency is lower than expected for the number of arrivals being on time.

Since $\frac{1}{8} \cdot 60 = 7.5$ and $7.5 < 36$, the observed frequency is higher than expected for the number of arrivals being late.

Rubric

a. 1 point for answer;
1 point for explanation

b. 1 point for answer;
2 points for explanation

7.SP.8a Answers

1. C
2. D
3. F
4. B
5. D
6. A, D
7. $\frac{2}{9}$. There are 2 outcomes where Ricardo selects a suit jacket and a shirt that are the same color, (black, black) and (white, white). There are 9 possible outcomes. So, the probability is $\frac{2}{9}$.

   Rubric
   1 point for answer;
   2 points for explanation

8. $\frac{1}{2}$. There are 6 outcomes where Fay selects boat tour 1 or bus tour B, (1, A), (1, B), (1, C), (1, D), (2, B), and (3, B). There are 12 possible outcomes. So, the probability is $\frac{6}{12}$, or $\frac{1}{2}$.

   Rubric
   1 point for answer;
   2 points for explanation

9. a. (H, H, H), (H, H, T), (H, T, H), (T, H, H), (T, T, H), (T, H, T), (H, T, T), (T, T, T)

   b. $\frac{1}{4}$. There are 2 outcomes in the sample space that have the coin landing heads up on the first flip and tails up on the second flip: (H, T, H) and (H, T, T). There are a total of 8 outcomes. So, the probability is $\frac{2}{8}$, or $\frac{1}{4}$.

   c. $\frac{1}{2}$. There are 4 outcomes in the sample space that have all three flips landing heads up or exactly one flip landing heads up: (H, H, H), (T, T, H), (T, H, T), and (H, T, T). So, the probability is $\frac{4}{8}$, or $\frac{1}{2}$.

   d. $\frac{7}{8}$. There are 7 outcomes in the sample space that have at most two flips landing tails up: (H, H, H), (H, H, T), (H, T, H), (T, H, H), (T, T, H), (T, H, T), and (H, T, T). There are a total of 8 outcomes. So, the probability is $\frac{7}{8}$.

   Rubric
   a. 1 point for answer
   b. 1 point for answer;
      1 point for explanation
   c. 1 point for answer;
      1 point for explanation
   d. 1 point for answer;
      1 point for explanation

10. a. (1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6)

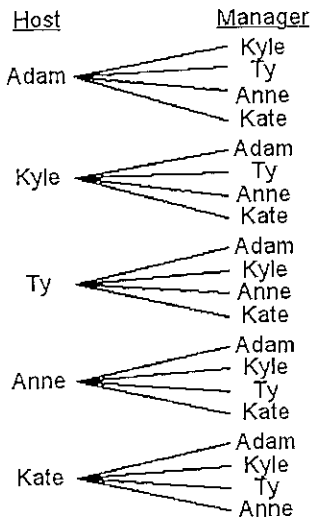
b. $\frac{1}{4}$. There are 6 outcomes where the total of the 2 rolls is greater than or equal to 8: (2, 6), (3, 5), (3, 6), (4, 4), (4, 5), and (4, 6). There are 24 possible outcomes. So, the probability is $\frac{6}{24}$, or $\frac{1}{4}$.

Rubric

a. 1 point

b. 1 point for answer;
2 points for explanation

11. a.



b. $\frac{1}{20}$. There is 1 outcome where a girl will host the event and Anne will manage the event: (Kate, Anne). There are 20 possible outcomes. So, the probability is $\frac{1}{20}$.

c. $\frac{7}{10}$. There are 14 outcomes where a boy will host the event or a girl will manage the event:
(Adam, Kyle), (Adam, Ty),
(Adam, Anne), (Adam, Kate),
(Kyle, Adam), (Kyle, Ty),
(Kyle, Anne), (Kyle, Kate),
(Ty, Adam), (Ty, Kyle),
(Ty, Anne), (Ty, Kate),
(Anne, Kate), and (Kate, Anne).
So, the probability is $\frac{14}{20}$, or $\frac{7}{10}$.

d. $\frac{1}{10}$. If Adam, Kyle, and Ty are the ones decorating the gym, then the positions of host and manager must go to Anne and Kate. So, there are 2 outcomes in which Adam, Kyle, and Ty will decorate the gym: (Anne, Kate) and (Kate, Anne). So, the probability is $\frac{2}{20}$, or $\frac{1}{10}$.

Rubric

a. 1 point for tree diagram

b. 1 point for answer;
1 point for explanation

c. 1 point for answer;
1 point for explanation

d. 1 point for answer;
1 point for explanation

7.SP.8b Answers

1. D
2. F
3. A
4. H
5. C
6. C
7. C
8. B
9. C, D, E, F
10. Possible table:

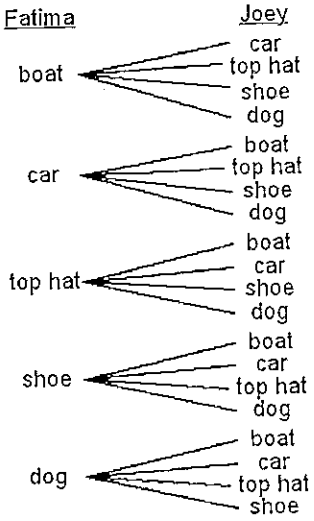
	S1	S2	S3
E1	(E1, S1)	(E1, S2)	(E1, S3)
E2	(E2, S1)	(E2, S2)	(E2, S3)
E3	(E3, S1)	(E3, S2)	(E3, S3)
E4	(E4, S1)	(E4, S2)	(E4, S3)

There are 6 outcomes where Ilana goes to office supply store S2 or electronics store E3: (E1, S2), (E2, S2), (E3, S2), (E4, S2), (E3, S1), and (E3, S3).

Rubric

2 points for the table;
1 point for correct outcomes

11. a.



b. $\frac{3}{5}$. There are 12 outcomes where neither Fatima nor Joey have the top hat and there are 20 possible outcomes. So, the probability is $\frac{12}{20}$, or $\frac{3}{5}$.

Rubric

a. 2 points
b. 1 point for answer; 1 point for explanation

12. a. (B, R), (B, Y), (B, S), (C, R), (C, Y), (C, S), (A, R), (A, Y), and (A, S)
b. The outcomes (B, R), (B, Y), (B, S), (C, Y), and (A, Y) have buttermilk pancakes or blueberry toppings.

Rubric

a. 2 points
b. 1 point

13. a.

	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	8	10	12
3	3	6	9	12	15	18
4	4	8	12	16	20	24
5	5	10	15	20	25	30
6	6	12	18	24	30	36

b. (4, 6), (5, 5), (5, 6), (6, 4), (6, 5), (6, 6)

c. $\frac{1}{6}$. There are 6 outcomes where the product of the two number cubes is at least 24, and there are 36 total outcomes in the sample space. So, the probability is $\frac{6}{36}$, or $\frac{1}{6}$.

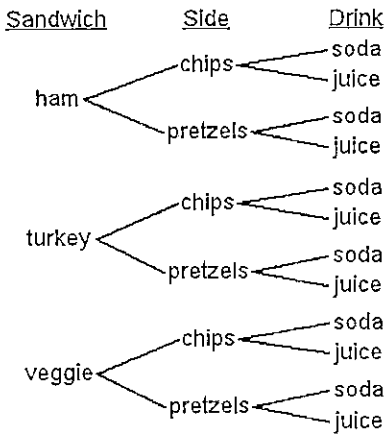
Rubric

a. 2 points

b. 1 point

c. 1 point for answer;
1 point for explanation

14. a.



b. There are 12 possible outcomes in the sample space, because there are 12 paths through the tree diagram.

c. $\frac{1}{4}$. There are 3 outcomes that have pretzels and juice. So, the probability is $\frac{3}{12}$, or $\frac{1}{4}$.

Rubric

a. 2 points

b. 1 point

c. 1 point for answer;
1 point for explanation

7.SP.8c Answers

1. D
2. B
3. E
4. E
5. A
6. C, D
7. a. Since 76% + 24% = 100%, all of the callers are either in favor of or opposed to the law. Since $24\% \cdot 50 = 0.24 \cdot 50 = 12$, the numbers 1 through 12 should be assigned to callers in favor of the new law. So, the value of N is 12.

   b. $\frac{3}{7}$. Trials 1, 6, 7, 8, 10, and 14 have exactly 2 numbers in the interval from 13 to 50. Since 6 of the 14 trials have exactly 2 numbers in the interval from 13 to 50, the experimental probability that exactly 2 of the next 3 callers are against the new law is $\frac{6}{14}$, or $\frac{3}{7}$.

   Rubric

   a. 1 point for answer;
   1 point for explanation

   b. 1 point for answer;
   1 point for explanation

8. a. 9 numbers. Multiply 45% by 20 to find the number of numbers that should be used to represent a customer paying with cash.

   $45\% \cdot 20 = 0.45 \cdot 20 = 9$

   b. Possible answer: Customers paying with cash are represented by numbers 1 through 9; customers paying with a credit or debit card are represented by numbers 10 through 20.

   c. Possible answer: Trials 4 and 8 have exactly 2 numbers between 1 and 9. Since 2 of the 10 trials have exactly 2 customers paying with cash, the simulation suggests that an approximation of the probability that exactly 2 of the next 5 customers pay with cash is $\frac{2}{10}$, or $\frac{1}{5}$.

   (Note: Answer will vary depending on assignments from part b.)

   Rubric

   a. 1 point for answer;
   1 point for explanation

   b. 1 point for each type of customer

   c. 1 point for answer;
   1 point for explanation