LESSON 1: HOW LIKELY IS IT?

EXERCISES

EXERCISES

- Review your end of unit assessment from the previous unit.
- Write your wonderings about samples and probability.
- Write a goal stating what you plan to accomplish in this unit.
- Based on your previous work, write three things you will do differently during this unit to increase your success.

LESSON 2: THEORETICAL PROBABILITY

EXERCISES

EXERCISES

1. Complete the table.

Fraction	Decimal	Percent
$\frac{1}{5}$		
	0.8	
		12%
$\frac{1}{3}$		
$\frac{7}{10}$		

2. When you flip a coin you should expect to get heads 50% of the time. The theoretical probability for heads is $\frac{1}{2}$. Which of the following results is *not* likely to be correct?

   A. 45 heads in 100 flips
   B. 36 heads in 72 flips
   C. 143 heads in 150 flips
   D. 6 heads in 10 flips

3. Which event has the highest probability?

   A. An 80% chance of rain tomorrow
   B. A $\frac{3}{4}$ chance of being chosen for class representative
   C. A 0.78 probability that you will choose a red marble from a bag of marbles
   D. The probability that you will choose a green marble if 170 out of 200 marbles in a bag are green

LESSON 2: THEORETICAL PROBABILITY

EXERCISES

4. Put a check mark beside each false statement. Explain why it is false.
   - You roll a number cube four times. You are more likely to get 2, 3, 1, 6 than 6, 6, 6, 6.
   - It is possible to flip a coin and get heads 20 times in a row.
   - The probability of rolling a 2 on a six-sided number cube is 0.25.

5. Bag A has 100 red jellybeans and 200 yellow jellybeans. Bag B has 10 red jellybeans and 12 yellow jellybeans. If you want a red jellybean, which bag should you pick from?

Challenge Problem

6. Suppose there is a 1 in 16 chance that the average student will have pizza for dinner. If your class has 80 students, about how many would you expect to have pizza for dinner? Use a range for your answer (for example, 10 to 11 students).

LESSON 3: EXPECTED RESULTS

EXERCISES

EXERCISES

1. Suppose you roll a number cube 120 times. How many times would you expect *not* to roll a 1 or a 6?

   A 30 times B 40 times C 60 times D 80 times

2. Suppose you roll a number cube 450 times. How many times would you expect to roll a 2?

   A 60 times B 75 times C 90 times D 150 times

3. Suppose you randomly draw a card from a regular 52-card deck of playing cards. What is the probability that you will draw a 7? Now suppose that you repeat the following process 425 more times: you replace the card, reshuffle the deck, and randomly draw again. How many times would you expect to draw a 7?

4. A spinner has 20 equally sized sections numbered 1–20. You win a prize if the spinner lands on a multiple of 4, and your friend wins if it lands on a multiple of 5. If the spinner is spun 100 times, who can expect to win more? By how many spins?

5. A favorable outcome is a result that you want to happen. A 10-sided number cube (numbered 0–9) is rolled 10 times, with a favorable outcome 3 times. It is then rolled 100 times, with a favorable outcome 37 times. In 500 rolls a favorable outcome is rolled 206 times. What might the favorable outcome(s) be?

Challenge Problem

6. A store has a contest in which each customer gets a random ticket. The contest is set up so that there is a 3% probability that someone will win. If the store prints 900 tickets, how many are winning tickets? If 371 people come to the store on Friday, how many people are likely to win the contest?

LESSON 4: SPINNERS

EXERCISES

EXERCISES

1. Suppose the experimental probability for an outcome is 0.4. How many times would you expect the outcome to occur in 500 trials?

   A 20 times B 100 times C 200 times D 400 times

2. There have been enough trials to be fairly confident that the probability of a certain spinner landing on red is 0.345. If the spinner is spun 40 times, how many times would you expect it to land on red?

   A 12 times B 14 times C 20 times D 34 times

3. A spinner lands on red 137 times in 400 spins. What is the experimental probability of landing on red? There may be more than one correct answer.

   A $\frac{137}{400}$ B $\frac{263}{400}$ C 34.25% D 0.6375

4. A spinner with four colored sections (red, blue, green, and yellow) is spun 80 times. The spinner lands on red 33 times, blue 32 times, and green 7 times. What is the experimental probability for each color? What does your answer indicate about the spinner?

5. An experiment has three outcomes that are not equally likely—A, B, and C. The experimental probability of A is 18%, and the experimental probability of B is 37%. If there were 250 trials, how many times would you expect each outcome to occur?

Challenge Problem

6. A spinner has four sections (red, blue, yellow, and green). The yellow section has a theoretical probability of 25% of being spun. In 500 spins the red section is spun 145 times and the blue section is spun 105 times. Based on this information, what is the experimental probability for each section?

LESSON 5: ESTABLISHING PROBABILITY

EXERCISES

EXERCISES

1. A bottle cap lands upside down 12 out of 20 times that it is dropped. Which ratio for the experimental probability is not correct?

   A $\frac{3}{5}$ B 0.6 C 55 out of 100 D 60%

2. What happens to experimental probability as the number of trials increases?

   A It becomes less accurate.

   B The difference between experimental and theoretical probability increases.

   C It becomes more accurate and approaches the theoretical probability.

   D It approaches zero.

3. Which of the following events would not have theoretical probability? There may be more than one correct answer.

   A Determining the chances of winning a lottery

   B Finding the probability that an 18-year-old male driver will be involved in a car accident

   C Finding the probability that a particular basketball player will make a free throw

   D Finding the probability of a spinner with 20 equal-sized numbered sections stopping on an even number

4. A coin is flipped 10 times; it lands on heads 5 times. The same coin is flipped 100 times; it lands on heads 62 times. Finally, the coin is flipped 1,000 times; it lands on heads 627 times. Which set of data is best for determining the probability of the coin landing on heads? What is the probability that the coin will land on heads?

5. Lucy has made 33 out of 60 shots so far this year in her basketball games. If she takes 18 shots in her next game, how many is she likely to make?

Challenge Problem

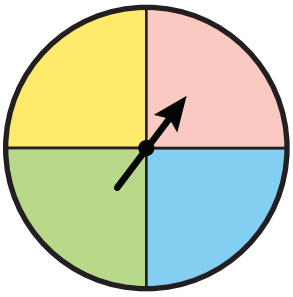
6. A thumbtack is dropped 50 times. It lands point up 37 times and it lands point down 13 times. What is the experimental probability for each outcome? If you drop the thumbtack 300 times how many times would you expect it to land point up and point down?

LESSON 6: COMPOUND EVENTS

EXERCISES

EXERCISES

1. What is the sample space for a multistage experiment of flipping a coin and spinning a four-part spinner?



A. H-blue, H-red, T-green, T-yellow

B. H-red, H-blue, H-green, H-yellow

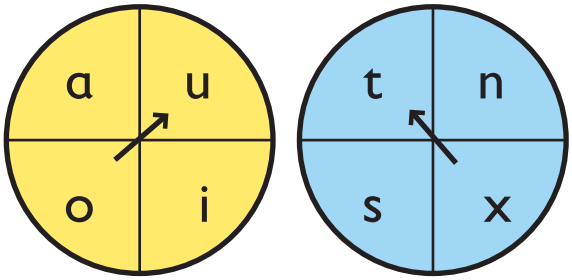
C. H-red, T-red, H-blue, T-blue, H-green, T-green, H-yellow, T-yellow

D. H-H, H-T, T-H, T-T, red-blue, blue-green, green-yellow, yellow-red

2. Suppose you flip a coin and roll a six-sided number cube. What is the probability that you will get tails and an even number?

A. $\frac{1}{12}$ B. $\frac{1}{6}$ C. $\frac{1}{4}$ D. $\frac{1}{2}$

3. Suppose you spin the spinner on the left and then the spinner on the right. What is the probability that the two letters will form an English word?



LESSON 6: COMPOUND EVENTS

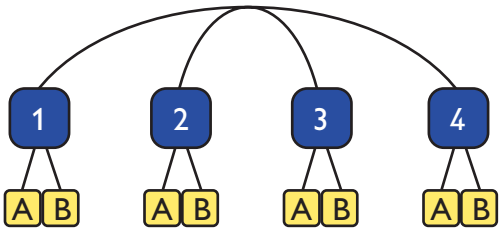
EXERCISES

4. The table shows the sample space for spinning a four-part spinner (with sections labeled A, B, C, D) and then a five-part spinner (with sections labeled V, W, X, Y, Z). What is the probability of spinning AZ?

	A	B	C	D
V	AV	BV	CV	DV
W	AW	BW	CW	DW
X	AX	BX	CX	DX
Y	AY	BY	CY	DY
Z	AZ	BZ	CZ	DZ

Ⓐ 25% Ⓑ 20% Ⓒ 10% Ⓓ 5%

5. The sample space for a compound event is shown. If the expected outcome for 100 trials is 25, what could the event be?



Challenge Problem

6. Three coins are flipped at the same time. In 100 trials how many times would you expect to have exactly two of the coins matching?

LESSON 7: INDEPENDENT COMPOUND EVENTS EXERCISES

EXERCISES

1. Maya is making a sandwich. She has 5 kinds of meat: ham, turkey, roast beef, pastrami, and salami. She has 4 kinds of bread: white, wheat, rye, and sourdough. How many different sandwiches can she make using 1 type of meat and 1 type of bread?

   A 9 sandwiches

   B 10 sandwiches

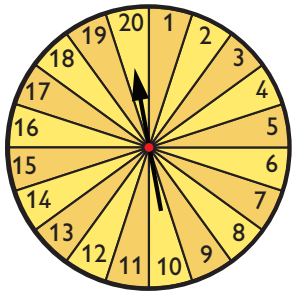
   C 20 sandwiches

   D 40 sandwiches

2. Two 10-sided dice (numbered 0–9) are tossed. What is the probability of getting a 3 on one die and a 7 on the other?

   A 0.01 B 0.02 C 0.05 D 0.1

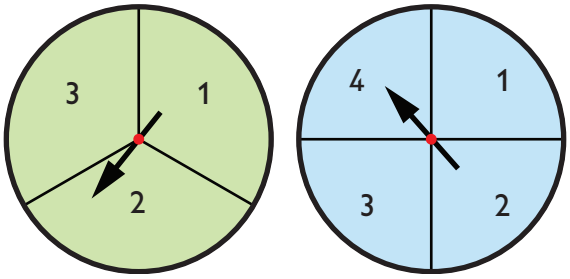
3. If a coin is flipped and then a 20-part spinner is spun, how many possible outcomes are in the sample space for the compound event?



   A 20 outcomes B 40 outcomes C 80 outcomes D 400 outcomes

LESSON 7: INDEPENDENT COMPOUND EVENTS EXERCISES

4. If these two spinners are spun 200 times, how many times would you expect the total shown on the two spinners to equal 5 or more?



5. Two standard number cubes (numbered 1–6) are rolled.
   a. Represent the sample space with a tree diagram, a list, or a table.
   b. If there are 180 trials, a certain event is expected 5 times. What could the event be?

Challenge Problem

6. A bag holds 10 red marbles, 15 blue marbles, and 5 green marbles. Suppose you reach in and randomly draw a marble, replace it, and then draw another marble. What is the probability that both times you draw a blue marble?

LESSON 8: SIMULATIONS EXERCISES

EXERCISES

1. A newly-married couple wants to have 3 sons. The newlyweds want to find out how many children they would need to have in order to get 3 boys.

   How could you simulate this situation by flipping coins?

2. A certain simulation was run with 20 trials in each set. The favorable result came up the following numbers of times in 10 sets.

   3, 5, 6, 7, 7, 8, 9, 10, 10, 15

   What do these results say about the experimental probability? There may be more than one correct answer.

   A. The experimental probability is $\frac{2}{5}$.
   B. The experimental probability is not likely to change with more sets of trials.
   C. Larger sets of trials are needed.
   D. More sets of trials are needed.

3. Maya and Marcus were investigating the following problem.

   > What is the probability that in a randomly selected group of 5 people at least 2 people will have the same birth month?

   Maya guessed that the probability of a match would be $\frac{5}{12}$. Marcus said the probability would be closer to $\frac{1}{2}$.

   Maya said, "Let's try a simulation. We can roll a 12-sided die and write down the number. After we've done that 5 times we'll see if we have a match."

   Marcus said, "We'll need to try that quite a few times to get an idea of the experimental probability. Let's try 20 trials."

   They conducted 20 trials and found 11 of them had matches. They tried another 20 trials and got 9 matches. "It looks like your guess of $\frac{1}{2}$ might be correct," Maya said.

   Marcus said, "Let's try some more." They wrote down how many matches they got in all of their trials: 11, 9, 13, 11, 14, 14, 15, 17, 11, 11.

   What is the experimental probability for their simulation?

Challenge Problem

4. At a large school 40% of the students are girls.

LESSON 8: SIMULATIONS

EXERCISES

a. What is the probability that at least 3 girls are chosen out of 10 randomly selected students?

b. How could this experiment be simulated using random numbers?

LESSON 9: DEPENDENT COMPOUND EVENTS EXERCISES

EXERCISES

1. You and your friends are learning a new card game that involves drawing certain cards in order from a standard 52-card deck. For practice, you want to determine different probabilities.
   a. What is the probability of drawing a club and then, without replacing the card, drawing another club?
   b. What is the probability of drawing an ace and then, without replacing the card, drawing another ace?
   c. What is the probability of drawing any number card (ace, 2, 3, 4, 5, 6, 7, 8, 9, 10) and then, without replacing the card, drawing a face card (jack, queen, or king)?
   d. What is the probability of drawing three kings in a row without replacing any of the cards?

2. Six people each purchase a ticket for a contest that has two prizes. The tickets are placed in a bowl and two tickets are drawn randomly. If two friends enter the contest, what is the probability that they will each win a prize?
   A 2.8% B 3.3% C 5.6% D ≈ 6.7%

3. Your friend places five cards face down. The cards are numbered 1–5. You choose two cards. What is the probability that the sum of the two numbers will be odd?
   A 0.48 B 0.50 C 0.60 D 0.72

4. In another contest 10 people each purchase a ticket. Jack buys 5 tickets and Marcus buys 1 ticket. Two tickets are drawn.
   a. What is the probability that Jack and Marcus will both win?
   b. What is the probability that either Marcus or Jack will win?

5. Maya is absolutely sure that she can draw a 4 card and then draw another 4 card (without replacement) from a standard 52-card deck. How likely is it that she will succeed? To challenge her, you need to come up with an even less probable situation. Describe a series of draws that is even less probable.

Challenge Problem

6. A drawer holds 24 red socks and 24 blue socks. In which situation would you have a higher probability of getting 2 socks that match? Why?
   A You pull out a sock, replace it, and then pull out another sock.
   B You pull out a sock and then pull out another sock.

LESSON 10: CHOOSING A PROJECT

EXERCISES

- Continue to work on your project.
- Check to ensure you have addressed all the rubric criteria in your project.
- Complete any exercises from Lessons 2 through 9 you have not finished.

LESSON 11: PUTTING IT TOGETHER 1

EXERCISES

- Read through your Self Check and think about your work in Lessons 1 through 10.
- Write down what you have learned during Lessons 1 through 10.
- What would you do differently if you were starting the Self Check task now?
- Which method would you prefer to use if you were doing the task again? Why?
- Compare the new approaches you learned about with your original method.
- Record your ideas—keep track of problem-solving strategies.
- Complete any exercises from Lessons 1 through 10 you have not finished.

LESSON 12: SAMPLES AND POPULATIONS

EXERCISES

EXERCISES

1. Which example would be likely to give a valid conclusion?
   - A Six students are surveyed about their favorite color.
   - B People are asked, "Is our lazy mayor doing a good job?"
   - C Thirty students are randomly sampled about their eye color.
   - D Four blonde students are asked about their hair color.

2. Which question is a biased question?
   - A What is your favorite color out of red, blue, and green?
   - B How old are you?
   - C Do you prefer a beautiful, sunny day or a depressing, rainy day?
   - D How many siblings do you have?

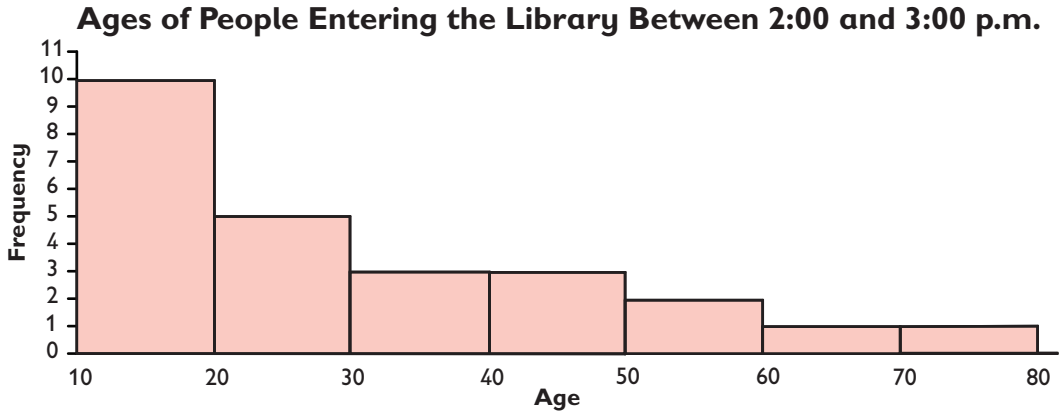
3. A sample of 5 students out of a population of 100 students is collected. The 5 students are playing dodge ball at recess and are asked whether they prefer playing outdoors or indoors. Which of the following is *not* true of the sample?
   - A The sample is not large enough.
   - B The survey method is biased.
   - C The sample is not random.
   - D The students are not part of the population.

4. There are 600 students in a middle school. For a project Lucy wants to find out what the students' favorite cafeteria food is. How should Lucy conduct the experiment?

LESSON 12: SAMPLES AND POPULATIONS

EXERCISES

5. What does the histogram show? Can this sample be used to find out the ages of people entering the library all day?



Challenge Problem

6. How could a company use a survey to show that its product is best?

LESSON 13: PROJECT WORK DAY

EXERCISES

- Continue to work on your project.
- Check to ensure you have addressed all the rubric criteria in your project.
- Complete any exercises from Lessons 2 through 12 you have not finished.

LESSON 14: ANALYZING SAMPLE DATA

EXERCISES

EXERCISES

1. There are 600 students in a school. What would be a good sample size to use in order to make generalizations about a topic?

   A 30 students

   B 60 students

   C 100 students

   D 600 students

2. A representative random sample shows that 35 students out of 50 surveyed play soccer more than any other sport. Based on the sample, if the population is 250 how many students play soccer?

   A 70 students

   B 135 students

   C 175 students

   D 200 students

3. What is the mean for this set of data?

   3, 5, 6, 7, 8, 8, 9, 10

   A 6 B 7 C 7.5 D 8

4. What is the median for this set of data?

   3, 5, 6, 7, 8, 8, 9, 10

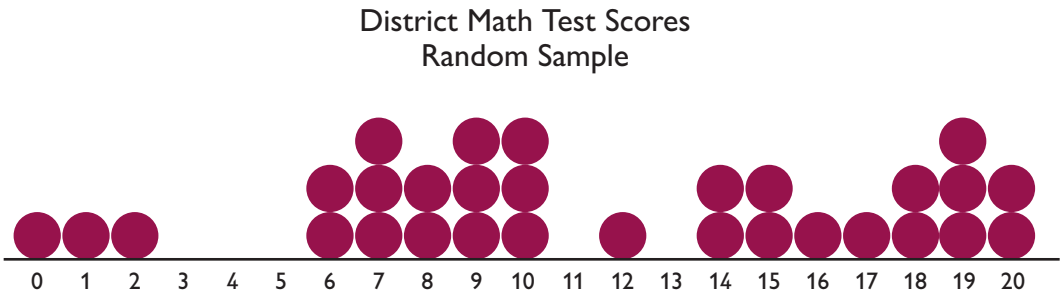
   A 6 B 7 C 7.5 D 8

5. The height of each student in a seventh grade class is measured. The mean height is 60 inches. The mode and median are also 60. The range of heights is 14, from 54 to 68. What can you conclude about this sample? How would this sample compare to the heights of all seventh grade students in the school if there were five seventh grade classes?

LESSON 14: ANALYZING SAMPLE DATA

EXERCISES

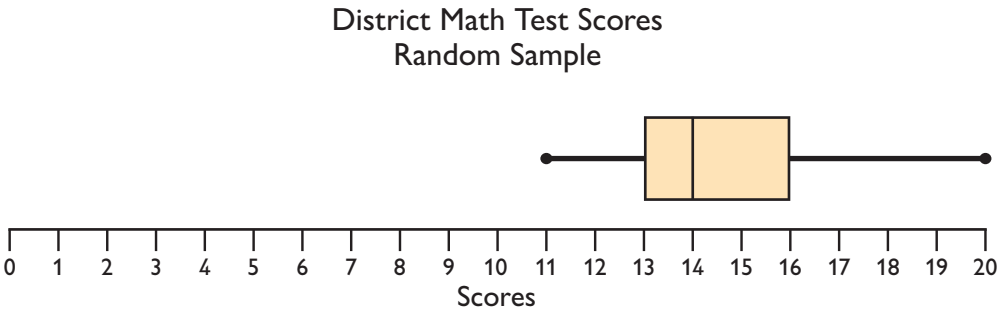
6. Here is a random sample of test scores taken from across the school district.



What can you conclude about the sample and the district scores?

Challenge Problem

7. This box plot summarizes the data from a representative random sample of test scores from a different district.



What can you conclude about how students did in the district? What is the probability that a student selected at random will have a score from 13 to 16?

LESSON 15: SAMPLE SIZE

EXERCISES

EXERCISES

1. There are 750 students at a school. It is determined that 30% of the students will be randomly sampled for a survey. How many students will be surveyed?

   A 200 students B 225 students C 300 students D 375 students

2. Five samples of marbles are drawn from a jar with the following results for red.

   26, 25, 25, 30, 27, 29

   What was the mean number of red marbles drawn?

   A 26.5 B 27 C 27.5 D 28

3. In a sample of 100 marbles 37 are green. Based on this sample, how many of the marbles in a jar of 500 marbles are green?

   A 180 marbles B 185 marbles C 200 marbles D 250 marbles

4. In a representative sample of 100 marbles 52 are red, 31 are yellow, and 17 are blue. Based on this sample, what could the proportion of the marbles in the whole jar be?

5. Five samples of 100 marbles show the following number of blue marbles:

   45, 42, 44, 47, 47

   Based on these samples, how many blue marbles are in the jar if there are a total of 600 marbles in the jar?

Challenge Problem

6. One day 100 fish are caught from a lake, tagged, and released back into the lake. Later, 100 fish are sampled and 5 of those 100 fish have tags. Based on this sample, how many fish are in the lake?

LESSON 16: COMPARING DATA SETS

EXERCISES

EXERCISES

1. Each box plot summarizes one class's scores on a district math test. Which class scored highest?

A 

B 

C 

D 

2. Which set of data has the highest mean?

   A. 5, 7, 9, 11, 13

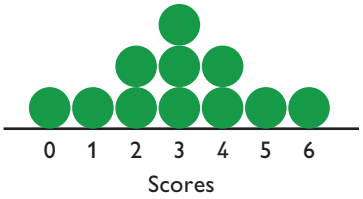
   B. 3, 6, 6, 8, 11, 14

   C. 9, 9, 9, 9, 10, 10

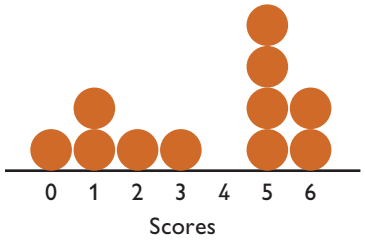
   D. 3, 7, 9, 9, 12, 14

3. Based on the medians, which class scored highest?

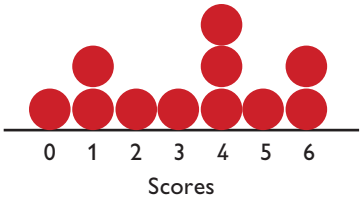
A. Math Quiz Scores Class 1



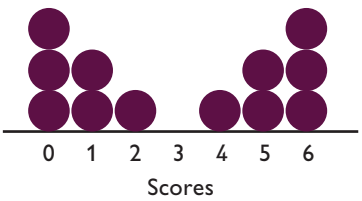
B. Math Quiz Scores Class 2



C. Math Quiz Scores Class 3



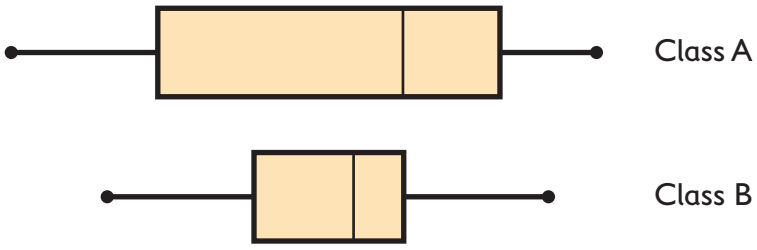
D. Math Quiz Scores Class 4



LESSON 16: COMPARING DATA SETS

EXERCISES

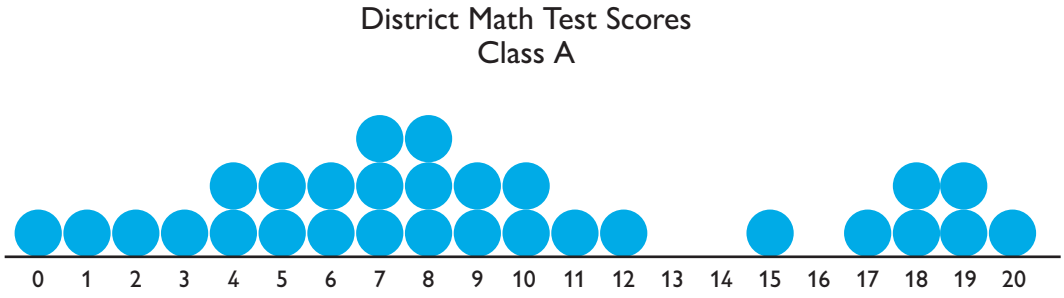
4. Class A and Class B measured the height of all the students (both classes have 32 students) and made these two box plots (using the same scale) to compare the classes. With the given information, is it possible to determine which class has the taller typical student?

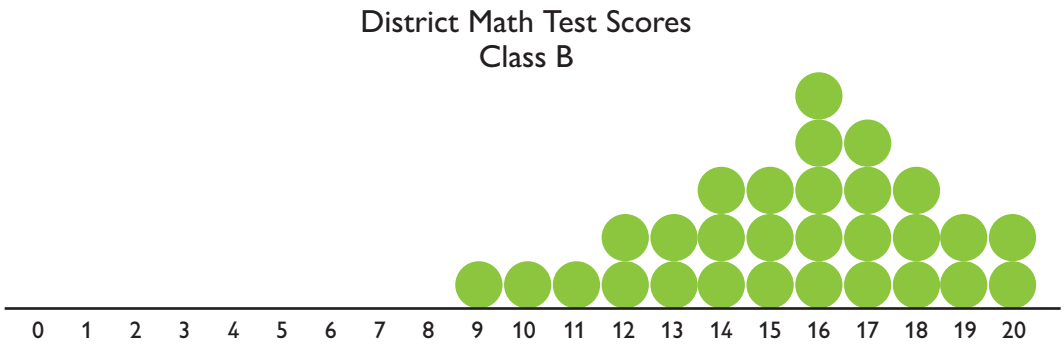


5. Class A has a higher mean jump distance than Class B, yet Class B has a higher median and a narrower range. What could account for these results?

Challenge Problem

6. Looking at the scores for the two classes, it is clear that Class B scored higher. If a student is drawn randomly from each class, what is the probability that the Class B student has a higher score?





LESSON 17: COMPARING TWO DATA SETS

EXERCISES

EXERCISES

1. Which typical time for estimating the length of a time interval is the most accurate, relative to the time interval estimated?

   A 9 seconds for an interval of 10 seconds

   B 22 seconds for an interval of 25 seconds

   C 46 seconds for an interval of 50 seconds

   D 94 seconds for an interval of 100 seconds

2. Which set of data has the highest mean absolute deviation?

   A 5, 7, 9, 11, 13

   B 4, 7, 7, 9, 12, 15

   C 8, 8, 9, 9, 10, 10

   D 3, 7, 9, 9, 12, 14

3. Which student scored the highest relative to the number of questions?

   A Lucy got 24 out of 25 correct.

   B Sophie got 36 out of 37 correct.

   C Marcus got 54 out of 56 correct.

   D Jack got 95 out of 98 correct.

4. Batting average is the ratio of hits to times at bat. Maya has a batting average of 0.625. Karen has a batting average of only 0.250, but she has 10 times as many hits as Maya. How is this possible? Assuming that the sample size for both players is large enough to get a representative batting average, who is the better hitter?

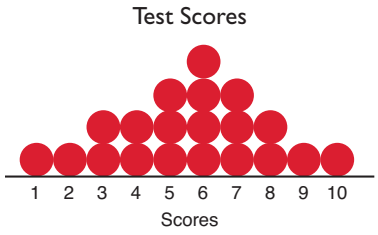
5. The MAD for the heights of players on the seventh grade basketball team was three times smaller than the MAD for the heights of all the seventh grade students. The mean for the seventh grade basketball team was 5 inches taller than the mean for the entire seventh grade. What do these measures tell you about the heights of the players on the seventh grade basketball team and the heights of students in the seventh grade?

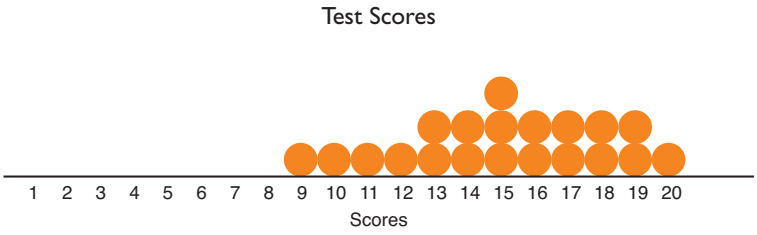
LESSON 17: COMPARING TWO DATA SETS

EXERCISES

Challenge Problem

6. Redraw each line plot so that the two plots can be compared using the same scale. Which group scored higher?





LESSON 18: PUTTING IT TOGETHER 2

EXERCISES

- Read through your Self Check and think about your work in Lessons 12 through 17.
- Write down what you have learned during the Lessons 12 through 17.
- What would you do differently if you were starting the Self Check task now?
- Which method would you prefer to use if you were doing the task again? Why?
- Compare the new approaches you learned about with your original method.
- Record your ideas—keep track of problem-solving strategies.
- Complete any exercises from this unit you have not finished.