

## Tennis Ball Bowling Activity – K-4.

Adapt the activity to meet the level and need for your students.

Materials: tennis balls (2-3 per group), masking tape, tape measure, “goal posts” such as staplers, books, trash cans, etc.(2 per group), tally cards/fraction model sheet with  $/3$ ,  $/4$ ,  $/5$ ,  $/6$ ,  $/8$ ,  $/10$  (1 set per group), Area, Line, and Set Models of Fractions handout, scissors, tape.

1. Prior to the activity, use an open area such as a gym or hallway to set up the lanes. Position two heavy objects such as trash cans at a distance of 6 to 8 inches apart. These will serve as goal posts to determine a strike or miss. Using masking tape, mark a distance of 10 feet.
2. Organize students in groups of 6. Each student will complete one bowling experiment. Give each student in the group a different tally card/ fraction model. The denominator of the fraction will be the number of attempts the student will bowl.
3. Students will take turns attempting to bowl their tennis balls through the goal posts. If a ball successfully rolls through the goal, the student will count it as a strike and shade in the corresponding box of the model on the tally card. Otherwise, count it as a miss and leave the box on the model unshaded. After their experiment is complete, the student should fill in the numerator at the top of the card with the number of strikes.
4. Explain to students that this number (strikes/attempts) is their fraction.

### Possible Extension Activities:

5. Instruct the group (of 6) to organize their fractions from least to greatest. Ask them to justify their decision.
6. Have students work in groups of 3 to complete the Area, Line, and Set Models of Fractions handout.
7. Regroup students who share common denominators. Have each group explore ways to model their fraction. They may choose to cut out and rearrange the area model from the tally cards. Encourage and facilitate dialogue within the groups.
8. Have students from the  $/3$  and  $/6$  attempts groups compare results to see if any fractions are equivalent. Maybe they can organize their fractions so that they are in order. Likewise, combine the  $/4$  and  $/8$  groups, and the  $/5$  and  $/10$  groups.

### Your ideas:

## Tennis Ball Bowling Activity – 5-8.

Adapted from CORD Algebra II

Materials: tennis balls (about 18), masking tape, tape measure, “goal posts” such as staplers, books, trash cans, etc.(2 per group), tally cards/fraction model sheet with  $/3$ ,  $/4$ ,  $/5$ ,  $/6$ ,  $/8$ ,  $/10$  (1 set per group), Tennis Ball Bowling handout, scissors, tape.

1. Prior to the activity, use an open area such as a gym or hallway to set up the lanes. Position two heavy objects such as trash cans at a distance of 6 to 8 inches apart. These will serve as goal posts to determine a strike or miss. Using masking tape, mark a distance of 20 feet.
2. Organize students in groups of 3 (Student A, Student B, and Student C). Each student will complete two bowling experiments. Give Student A row 1 (strikes/3 and strikes/10) of tally card/ model sheet. Student B will receive row 2 (strikes/5 and strikes/6) and Student C will receive row 3 (strikes/4 and strikes/8). The denominator of the fraction will be the number of attempts each student will bowl for each of their two experiments.
3. Students will take turns (A, B, C, A, B, C) attempting to bowl their tennis balls through the goal posts. If a ball successfully rolls through the goal, the student will count it as a strike and shade in the corresponding box of the model on the tally card. Otherwise, count it as a miss and leave the box on the model unshaded. After each experiment is complete, the student should fill in the numerator at the top of the page with the number of strikes.
4. Give each student a Tennis Ball Bowling handout and have each student record their own results and their group members’ results in the table. For the “Model” column, students can cut out, rearrange, and tape the shaded/unshaded fraction model from the tally card. Students can then individually guess how each experiment will rank according to the fraction and model. Have students compare their conjectures within their group, and encourage dialogue among group members. Before moving on, you may want each group to give a brief presentation of results to the class. (think-pair-share)
5. Students will complete the rest of the handout individually, then pair with the group to check results, then share with the class their results.

## Tennis Ball Bowling Activity – 9-12.

Adapted from CORD Algebra II


Materials: tennis balls (about 18), masking tape, tape measure, “goal posts” such as staplers, books, trash cans, etc.(2 per group), Tennis Ball Bowling handout.


1. Prior to the activity, use an open area such as a gym or hallway to set up the lanes. Position two heavy objects such as trash cans at a distance of 6 to 8 inches apart. These will serve as goal posts to determine a strike or miss. Using masking tape, mark a distance of 20 feet.
2. Organize students in groups of 3 (Student A, Student B, and Student C). Each student in the group will make 8 attempts to bowl their tennis balls through the goal posts while other members help count and return balls. If a ball successfully rolls through the goal, the student will count it as a strike. Otherwise, count it as a miss. Record the strikes and misses in the tally chart on the Bowling for Rational Expressions handout.
3. Have students work in their group to answer the questions on the handout for their rational expression. Dialogue should be encouraged within the group. Have groups share results and any thoughts or conjectures regarding the assignment with entire class and/or journal about their results.

### Ideas/Extension Activities/Options:

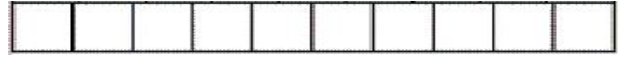
/3





 = Strike

 = Miss

/10





 = Strike

 = Miss

/5





 = Strike

 = Miss

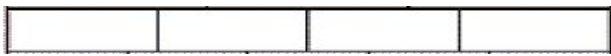
/6




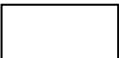
 = Strike

 = Miss

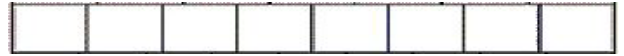
/4




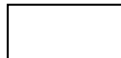
 = Strike

 = Miss

/8


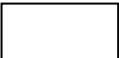


 = Strike

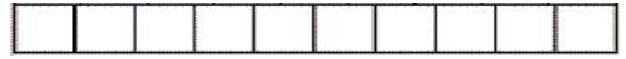
 = Miss


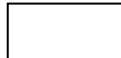
\_\_\_\_\_ strikes  
**3** tries



 = Strike  
 = Miss


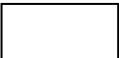
\_\_\_\_\_ strikes  
**10** tries



 = Strike  
 = Miss


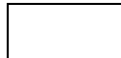
\_\_\_\_\_ strikes  
**5** tries



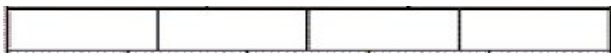
 = Strike  
 = Miss


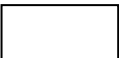
\_\_\_\_\_ strikes  
**6** tries



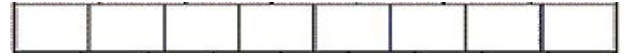
 = Strike  
 = Miss


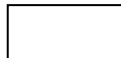
\_\_\_\_\_ strikes  
**4** tries



 = Strike  
 = Miss

\_\_\_\_\_ strikes  
**8** tries



 = Strike  
 = Miss

Other's Results My Results

Fraction	Model	Rank

Use the results obtained from the bowling tennis balls activity to complete the chart and answer the questions.

Answer the following questions using complete sentences.

1. What equivalent fractions (if any) did your group obtain?
  
2. How can

you be certain these fractions are equivalent?

3. Copy the "Fraction" and "Model" columns from the previous page. Then complete the rest of the table.

My Results  
Other's Results

<u>Fraction</u>	<u>Model</u>	<u>Decimal</u>	<u>Percent</u>	<u>Rank</u>

4. Suppose a classmate is allowed to bowl 12 times. How many strikes does the student need to equal your score on:
- a. 6 attempts?
  
  
  - b. 4 attempts?
  
  
  - c. Justify your answer by using a line model.



	<u>Tally</u>	<u>Total</u>
Number of Strikes		
Number of Misses		

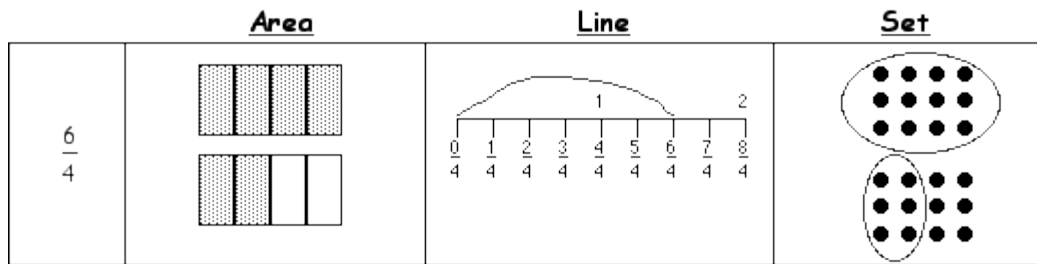
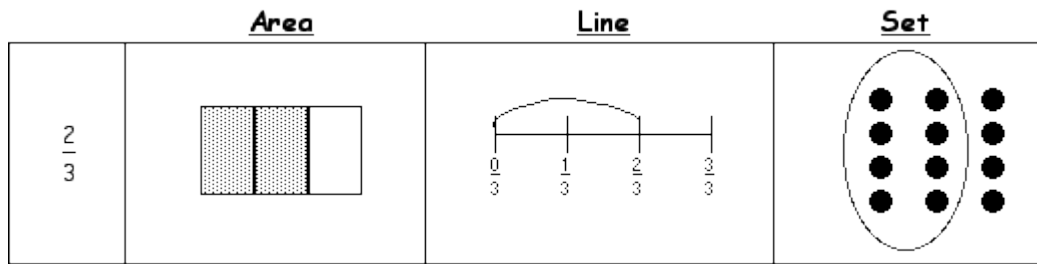
1. Calculate your percent of strikes.
2. Suppose you were to make a strike on your next  $n$  consecutive attempts. How would your average strike percentage change with each additional strike?
3. Write a rational function  $P(n)$  that models your strike percentage on your next  $n$  attempts.
4. What would your strike percentage be if you make five consecutive strikes?
5. Graph your function using a graphing calculator. Determine your ideal strike percentage. For example, if you made 4 out of 8 strikes for 50%, you might want your percentage to be as high as 65% or 70%. Approximate how many consecutive strikes you would have to make in order to reach your desired strike percentage.
6. Let  $p_o$  represent your desired strike percentage. Solve the rational equation  $P(n)=p_o$  to find the number of consecutive strikes you need to make to achieve this average.

## Area, Line, and Set Models of Fractions

At some point, students will need to begin the transition from a hands-on approach to a more symbolic approach to fractions. Before completely abandoning the use of concrete manipulatives in favor of pure symbolic notation, a transitional step of using drawings of fractions is recommended.

In this transitional period, students are required to master three models for drawing fractions: area, line, and set.

Examples:



<u>Fraction</u>	<u>Area</u>	<u>Line</u>	<u>Set</u>

### Extension questions and ideas:

1. Have students combine their results on the two tries into one result. For example, if student A bowled  $\frac{2}{3}$  and  $\frac{6}{10}$ , then the combined result would be  $\frac{8}{13}$ . If student B bowled  $\frac{3}{4}$  and  $\frac{3}{8}$ , then the combined result would be  $\frac{6}{12}$ . If student C bowled  $\frac{1}{5}$  and  $\frac{3}{6}$ , then the combined result would be  $\frac{4}{11}$ . Have students compare their combined results, rank, show model, convert to decimal and percent, etc.
2. Have students average their two results. For example, if student A obtained  $\frac{2}{3}$  and  $\frac{6}{10}$ , then the average would be  $\frac{\frac{2}{3} + \frac{6}{10}}{2} = \frac{\left(\frac{20}{30} + \frac{18}{30}\right)}{2} = \frac{19}{30}$ . Have them compare and contrast (perhaps as a writing assignment or journal activity) the combined result ( $\frac{8}{13}$ ) from above with the average ( $\frac{19}{30}$ ). Are these fractions equivalent? Why or why not? Which measure is the best descriptor of how good you are at bowling tennis balls? Etc.
3. Have students explore how many more attempts with strikes they would need to bring their percentage from a particular attempt to, say 80% or a goal of their choice. For example, if student A wants to bring his/her  $\frac{2}{3}$  result (67%) to a 90%, then he/she would need 7 more consecutive strikes to equal a 90% success rate. If students are capable, have them write an algebraic expression to describe this situation. For example,  $\frac{2+n}{3+n} = \frac{9}{10}$
4. Your thoughts and ideas: