Let’s Go Bowling
Lesson for the fx-300ES PLUS
Let’s Go Bowling: Common Core State Standards

6.RP.2 – Understand the concept of a unit rate \( \frac{a}{b} \) associated with a ratio \( a:b \) with \( b \neq 0 \), and use rate language in the context of a ratio relationship. For example, “This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is \( \frac{3}{4} \) cup of flour for each cup of sugar.” “We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger.”

6.RP.3 – Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

6.NS.2 – Fluently divide multi-digit numbers using the standard algorithm.

6.NS.3 – Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

6.EE.9 – Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variables, in terms of the other quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables, using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distance and times, and write the equation \( d = 65t \) to represent the relationship between distance and time.

6.SP.5c – Summarize numerical data sets in relation to their context such as by: C. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which data were gathered.

7.EE.4b – Use variables to represent quantities in real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. B. Solve word problems leading to inequalities of the form \( px + q > r \) or \( px + q < r \), where \( p \), \( q \), and \( r \) are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make and describe the solutions.

8.G.9 – Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
Let’s Go Bowling: Objectives

STANDARDS FOR MATHEMATICAL PRACTICE:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
6. Attend to precision.

ENGAGE

Access students’ knowledge by asking the following questions:

❍ How many of you have ever gone bowling?
❍ How many frames are there in a bowling game?
❍ How heavy is a bowling ball?
❍ How long is a bowling lane?

EXPLORE

Explore students’ understanding and/or inquiry by asking:

❍ What are the dimensions of a bowling lane?
❍ What are the possible weights of a bowling ball?
❍ What are the possible weights of a bowling pin?
❍ How do you keep score in bowling?

EXPLAIN

Have students explain their thoughts/ideas to the following questions:

❍ Explain why it might be better to pay per game rather than per hour?
❍ Explain why you might want to track your bowling scores over time?
❍ Explain why bowling is or is not a form of exercise?

EXTEND

Extend student understanding by asking the following questions:

❍ How many pounds of bowling pins would you potentially knock down in an entire game?
❍ How would you create a model to determine how many miles someone walks while bowling?
❍ What other questions do you still have about bowling?
Let’s Go Bowling: Getting Started

Bowling has a rich history that dates as far back as 5000 B.C. Today, an estimated 70 million people go bowling at least once each year.

A bowling game consists of 10 frames. The object of each frame is to knock down all of the pins in either one ball or two. Players roll a bowling ball down a special surface called a lane that is made of wood or a synthetic material.

In this activity, you will answer a series of questions (or frames) related to bowling. For each question you answer correctly, give yourself 30 pins. Answer all ten questions (or frames) correctly and you will have a perfect score of 300!

Here is some information to help you answer some of the questions.

| Length of the bowling lane                | 62 feet and 10 13/16 inches long  
|                                         | (From the foul line to the center of the head pin is 60 feet.)  
|                                         | The approach, the space a player uses to deliver the bowling ball, is 15 feet long.  

| Dimensions of a bowling ball             | A bowling ball may have a circumference between 26.704 inches (67.83 cm) and 27.002 inches (68.59 cm) and a diameter in the range of 8.500 inches (21.59 cm) and 8.595 inches (21.83 cm.)  

| Weight of a bowling ball                 | A bowling ball can weigh between 6 lbs. and 16 lbs.  

| Weight of a bowling pin                  | Each bowling pin can weight as little as 3 lbs., 6 oz. to as much as 3 lbs., 10 oz.  

http://en.wikipedia.org/wiki/Bowling  
http://www.iowabowl.com/jcusbcba/Tips/bowling_lane_dimensions.htm
## Let’s Go Bowling: Problems

<table>
<thead>
<tr>
<th>FRAME</th>
<th>QUESTION</th>
<th>ANSWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The bowling center is 14 miles from your house. A parent/guardian will drive you to the bowling center at an average rate of 35 miles per hour. Approximately, how many minutes will it take to drive to the bowling center from your house?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>The bowling center charges $3.75 per game, g, and $2.25 to rent bowling shoes. Write an inequality to find the maximum number of games you can bowl and rent shoes for $20.00. How many games can you bowl and rent shoes for $20.00?</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Use the above measurements to approximate the volume of a bowling ball.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>There are 10 bowling pins in a full rack. The object of the game is to knock down all 10 pins in either one ball or two in each frame. Given the above specifications, what is the least amount 10 bowling pins weigh? Given the above specifications, what is the most 10 bowling pins weigh?</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>When bowling a perfect game, you throw 12 strikes in a row. Use the above specifications to determine how many feet your bowling ball must travel when bowling a perfect game.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>You are bowling four games and want to have an average of 137. You have already bowling games of 119, 156, and 142. Write an equation you would use to determine your score for the last game. Let x = your score for the last game. What score do you need to bowl in your last game to have an average of 137?</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Which bowler had the greatest percentage of increase between their first game and second game?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>First Game</th>
<th>Second Game</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brett</td>
<td>157</td>
<td>168</td>
</tr>
<tr>
<td>Jose</td>
<td>129</td>
<td>140</td>
</tr>
<tr>
<td>Susie</td>
<td>212</td>
<td>230</td>
</tr>
</tbody>
</table>

| 8     | According to the Professional Bowlers Association, Parker Bohn III set the highest 64-game record with a total pin fall of 14,924 pins. What was Parker’s average? [http://news.pba.com/page/PBA-Tour-Scoring-Records.aspx](http://news.pba.com/page/PBA-Tour-Scoring-Records.aspx) |        |
| 9     | How many times must one person throw the same bowling ball to equal the weight thrown of one ton? Approximately, how many games is that? |        |
| 10    | A bowler can use a maximum of 15 feet on the lane to make their approach. How many times must a bowler make their approach to be equivalent to walking one mile? (A mile is 5,280 feet.) |        |
1. 24 minutes
   One solution is to use the Table feature and create an expression to find the total number of minutes to drive to the bowling center. Setting the start value to 0 and the end value to 1 with a step increment of 0.1, allows you to determine that 0.4 hours are needed to travel 14 miles.
   60 minutes X 0.4 hours = 24 minutes

2. 3.75 + 2.25 < 20.00
   4 games

3. Because of the variability in a bowling ball’s diameter, the volume of a bowling ball can range from approximately 321.5551 cubic inches to 332.4576 cubic inches.

4. The least 10 bowling pins can weigh is 33 lbs., 12 oz.
   The most 10 bowling pins can weigh is 36 lbs., 4 oz.
Let’s Go Bowling: Answers (con’t)

5. 754 feet, 9.75 inches

6. You will need a score of 131 to have an average of 137 for four games.

7. Jose has the largest percent of increase in his scores between the first and second games.

8. 

\[
\begin{align*}
14924 \div 64 &= 233.1875
\end{align*}
\]
9. Create a table to determine how many times you must throw a ball to be equal to or greater than the weight thrown of one ton.

To determine the number of games, determine an appropriate number of times one would throw a bowling ball during a game. For example, the maximum number of times someone could throw a bowling ball during a game is 21 times. (2 shots per frame, plus a bonus roll in the tenth for converting a spare.) The least number of throws would be 12 (perfect game).

For a 15 lb., 4 oz. bowling ball, you would throw the ball 130 times to be equal to or greater than one ton. Next, divide that number by a reasonable amount of times you throw a bowling ball. Let’s use 18.

We can conclude that you would need to bowl approximately 7.2 games to throw the weight of one ton while bowling.

10. Use the table function to create a series of values of different approach lengths to show how many times a person must make their approach to equal one mile.