Fraction Frenzy

Introduction: For students to gain a better understanding of addition with the fractions $\frac{1}{4}$ and $\frac{1}{2}$ (or in using multiples of $\frac{1}{4}$).

Standards Addressed: NYMST Standards 1 and 3
Conceptual Understanding
Procedural Fluency
Number Sense and Operations
Communication

Objectives: 1. Students will use basic addition of fractions to reach a designated number, in this case, the number nine.
2. Students will then use problem-solving and/or critical thinking skills to develop what they believe to be a fool-proof, winning strategy.
3. Students will test their strategies.
4. Students will use communication skills to discuss these strategies and why they are or are not successful.

Instructional Protocol: Discuss the basic rules of the game. Once the students understand the concept, use pairs to let the students work with the game. Ask the students to figure out a possible winning strategy. Create larger groups to discuss possible winning strategies and why the strategies might work. Discuss these strategies as a whole class. Close with discussion on what worked and why.

The basic lesson/activity can be applied to any classroom. There are many different versions or variations that can make things more interesting and more challenging. Race to 100 by 10’s and Race to 30 by 2’s are two possibilities. Some things that you might consider for use with different types of learners are mixed groupings, visual aids (such as quarters for this particular version), and moving game pieces or having students actually represent their game piece (add one to your opponents number then move a distance of one floor tile towards your goal).
Fraction Frenzy - The object of the game is to be the first player to reach 9 when counting by quarters ($\frac{1}{4}$) or halves ($\frac{1}{2}$). Each player adds $\frac{1}{4}$ or $\frac{1}{2}$ to the number of his or her opponent.

EX: Let p1 be player 1 and p2 be player 2

- p1 says - $\frac{1}{2}$
- p2 says - $\frac{1}{4}$  ($\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$)
- p1 says - 1 $\frac{1}{2}$  ($\frac{1}{2} + \frac{1}{2} = 1 \frac{1}{2}$)
- p2 says - 1 $\frac{1}{4}$  ($1 \frac{1}{2} + \frac{1}{4} = 1 \frac{3}{4}$)...and so on, until one player reaches nine.

Students will write down each number and their opponent’s number. They must be responsible for making sure all addition is accurate.

Students should be looking for patterns. If students cannot find the mathematical rule that allows them to win each time, they can still find patterns and certain ‘magic numbers’ that the winner must say in order to guarantee victory.

Students could utilize a grid that displays quarters or use actual quarters.

EX:

<table>
<thead>
<tr>
<th>$\frac{1}{4}$</th>
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</table>

Students can now mark off the fourths that are used while making note of the numbers.

For more concrete-operational learners, use money to relate to the game. Show the connection between 25 cents and $\frac{1}{4}$ or one quarter dollar. The target or goal is actually $9 and you have to step up by 25 or 50 cents. A grid or table might also be useful to place quarters in boxes and keep track of total value.
There are many different variations of the game that could also be used, such as Race to 100 by adding no more than 10 or the Race to 30 by adding 1 or 2, just to name a couple. You may also notice that you can consider the money example a race to 36 by 1 and 2 (remember, $9 happens to be 36 quarters).

Two great activities that can be done with older or more advanced students is to create your own race to a number game or finding the mathematical rules that guarantee victory for any of these types of games.

EX: Consider the Race to 100 - we add no more than 10 each time. What if the range is changed from 1-10 to 1-7? What effect does it have on the game?

EX: Create Your Own - Race to 50 by 3’s, Race to 70 by 8’s, etc...

The formula to guarantee victory is a little more challenging: For any Race to N by K, where both N and K are whole numbers, the challenger must take certain steps.

First: Divide N by (K + 1)

Case 1: If the remainder is greater than 0, the challenger must go first AND use the remainder as the first number
To finish, the challenger must continue to add (K + 1) to the previous total

Case 2: If the remainder is 0, the challenger must let their opponent go first
To finish, the challenger must say the multiples of (K + 1)

What is the general rule for fractions? Rules will be very similar to what is mentioned above (maybe consider the relationship between Fraction Frenzy and Race to 36 by 2’s).

Not all answers need to be this abstract or mathematically complex: consider the 1st-grader who, upon realizing she lost when her opponent reached 27 in the Race to 30 by 2’s, took only a moment to see it as a critical number, count backwards by threes from 27 to reach 3, and finally told her opponent to go first and completed her winning strategy. Answers can be found in the patterns by nearly anyone.
FRACTION FRENZY

The Object of the Game: be the first player to reach the number Nine

The Catch: you may only count with fourths or halves

The game is played as follows:

Choose one player to begin the game. The first player must say either \( \frac{1}{4} \) or \( \frac{1}{2} \). The second player must then add \( \frac{1}{4} \) or \( \frac{1}{2} \) to that number and say the sum aloud. The game proceeds in the same fashion until one player can say ‘nine’ exactly.

For example, a game may start like this:

Let p1 be player 1 and p2 be player 2

\[
\begin{align*}
\text{p1 says } & - \frac{1}{2} \\
\text{p2 says } & \frac{1}{2} \quad \left( \frac{1}{2} + \frac{1}{2} = \frac{1}{4} \right) \\
\text{p1 says } & - 1 \frac{1}{4} \quad \left( \frac{1}{4} + \frac{1}{4} = 1 \frac{1}{4} \right) \\
\text{p2 says } & - 1 \frac{1}{4} \quad \left( 1 \frac{1}{4} + \frac{1}{4} = 1 \frac{1}{2} \right) \ldots \text{and so on}... \\
\end{align*}
\]

Be sure to record the numbers that you and your opponent say to double check the addition.
Fraction Frenzy Worksheet

Record each step in your fraction game, made by you or your opponent, in the space below.

1. Do you notice any patterns or special numbers that seem helpful in winning the game?

2. Describe a strategy that you think will guarantee your victory:

3. Does your strategy really work?

4. Was there a winning strategy was discovered by your group? By the class?

5. Are there any hints you may have for a person just learning the game?