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| **Synopsis of task:**  Students play the game, “Take 2 or 1” with a partner. While they are playing against one another, their real task is to figure out if there is a strategy to winning the game and what that strategy is.  **Anticipated student time spent on task:** 45-50 minutes  **Student task structure(s):** Partner work |
| [**Math Content Standards and Practices**](http://www.doe.mass.edu/frameworks/math/2017-06.pdf)**:**  **4.OA.C.5** Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.  **SMP1** Make sense of problems and persevere in solving them.  **SMP3** Construct viable arguments and critique the reasoning of others.  **SMP7** Look for and make use of structure |
| **Prior Knowledge:**  **1.OA.B** - Understand apply properties of operations and the relationship between addition and subtraction. **2.OA.B** - Add and subtract within 20.  **2.MD.B.6** - Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, …, and represent whole-number sums and differences within 100 on a number line diagram. |
| **Connections to the real-world:**  This game will require children’s knowledge of game theory, strategy, and patterns. |
| **Mastery Goals:**  **Learning Objective:**  Students will be able to develop a mathematical model which shows why their strategy will result in a win.  **Language Objective:**  Students will be able to describe their strategy as it relates to multiples and pattern of multiples. |
| **Teacher instructions**  **Instructional Tips/Strategies/Suggestions:**   1. Hand out “Rules for Take Away 2 or 1”, extra scrap paper, and colored pencils.  * Explain the rules out loud. * Demonstrate the game with a student at the board. * Emphasize that while students are playing against their partner, they are ultimately working together to figure out if there is a strategy to always winning the game and if there is what that strategy is as a team. * As you walk around, ask students if there seems to be a magic number or magic numbers which allow you to win.  1. After students have played several rounds, come together and brainstorm some strategies. Let kids have 10-15 minutes to test strategies (try to “break” it; in other words, one kid plays using the strategy, other student tries to beat them).   Strategies they might see: As students work together, they will figure out the strategy is land on multiples of 3. From there, students can change the rules (some suggestions would be → What if it was take away 3, 2, or 1? What if three people were playing?).   1. Come back together, talk about magic numbers. For homework- Take Away 2 or 1 Follow Up. What ways can you show that 3, 6, 9… are magic numbers for this game? 2. Hand out “Take Away 2 or 1 Follow Up” for homework. |
| **Instructional Materials/Resources/Tools:**   * Hand out “Take Away 2 or 1” sheet * Extra scrap paper * Colored pencils * Take Away 2 or 1 Follow Up. What ways can you show that 3, 6, 9… are magic numbers for this game? |
| **Accessibility and Supports:**  **Potential sentence starters:**   * One magic number I could get so that I know I win is \_\_\_ because \_\_\_\_” * Since \_\_\_\_ is a magic number, the next magic number letting me get to this number is \_\_\_ because \_\_\_”   **Key academic vocabulary:** Multiples, odd, even, sequence, subtract, pattern, set of numbers |

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| Name: Period:    **Assignment: Take Away 2 or 1**  Directions:   * Play three rounds with your neighbor * Each player uses different color pencil * Player 1 picks a number between 20-40 * Player 2 takes away 2 or 1, write the result under the original number. * Player 1 takes away 2 or 1 from the new number and writes the result underneath.] * Play continues until one player gets to ZERO. This player is the winner. * Play at least three games.   Question: You and your partner are working together to figure out, is there a strategy? If so, what is it?  Game 1 Game 2 Game 3    **Back →**   1. Are there any “magic” numbers that you know you’ve won if you land on them? 2. Describe the strategy in words. 3. SHOW why this works with a picture or diagram.   **Sample Student Work:**  **Student work. Three games of Take 2 or 1 were played.**  **Student work. A child explains the strategy.**  **Student work. Three games of Take 2 or 1 were played.**  **Student work. The student explains the strategy.** |