

## Number Battleship

The following describes a simple game for familiarizing students with multiplication facts and encouraging teamwork and problem solving skills. I call the game “Number Battleship.” The game helps students mentally link two alternate frameworks: sets with their cardinalities and the integers modulo 10 as a ring. In one setting, one counts elements of sets; in the other, one sees how multiples of 7 compare with multiples of 10. For instance,  $6 \times 7 = 42$  means change the base 7 expression “60” to the base 10 expression “42”. Let's focus on where the expressions “10”, “20”, “30” fit modulo 10 when we convert them from base 7 to base 10. Doing so gives us the sequence “7,4,1,8,5,2...”. This pattern becomes transparent on a hundreds chart with 10 rows and 10 columns where it is represented by linear stripes of entries. Each ideal of integers with generators 1 through 10 have distinct linear stripes or patterns on a hundreds chart that can be easily memorized—especially since the patterns are very visual. It also becomes readily apparent which patterns are sub-patterns of others: i.e. 3's contain 6's and 9's. These patterns are even useful for visualizing division by identifying how much of a pattern occurs before a given entry on the chart. After the children have worked through these patterns, discovering them and their relationships, they are ready to play the game.

Plain and simply, the game is a “glorified” version of “tic-tac-to.” The children are split into two teams. On the smart board is displayed an interactive hundreds chart and four different target numbers strategically selected. These numbers are highlighted on the chart in red. Above the chart, the numbers 2,3,4,5,6,7,8,9,10, which serve as the “ammo,” are displayed. Each of these (piece of ammunition) may be used only one time. The two teams take turns. Each team can only use one of the ammo numbers per turn. If the team at play selects the number “8”, I highlight all the multiples of “8” in green (instantly with a special feature on the interactive hundred's chart) and the class can observe which target numbers were hit. If a team hits a target three times, the team captures the target and gets a point; the target is no longer highlighted on the chart. The round is over when either all targets are captured or the remaining ammo cannot hit any more targets. The next round then ensues with a new set of target numbers.

Minimally, the game requires some writing, hundreds charts, and sets of target numbers. Some possible sets of targets are: {30, 36, 40, 42} and {24, 30, 40, 63}. One quick method for developing target sets is by creating a 4x2 table (4 rows and 2 columns) and filling it in with eight distinct numbers in the range 2 to 10 according to one rule: the g.c.d. of each row is strictly smaller than both of its entries and preferably as small as possible. Multiply the rows together for your target set. You may multiply the unused number between 2 and 10 to one of the row products as may be appropriate.

The feedback I received from this game was very positive. One student wrote “Your games are cool to play. I like to play Battleship numbers.” Karen Rakowitz, a second grade teacher at Nash Elementary, had rarely seen her students work together and problem solve so well. She even called the principal to come and watch the game. In her own words, she relates:

“I was very hesitant to have the kids play this game – I thought for sure that they would be frustrated by the complexity. Boy, was I wrong!

“First, second graders are so very motivated by the idea of multiplying. They dug right in and highlighted the factors on the sheets that they would later refer to. They were even helping each other create the papers so that there would be enough for all the kids to refer to during the game.

“The kids were divided into 2 teams – I think we had about 9 or 10 kids on a team. They

sat around tables that were pushed together which gave them each a “place” to be and an area for the reference sheets.

“Although I was often in the dark about the strategies that they were using, the kids knew just what to do. It was interesting that some of the best players were not necessarily the strongest math students. One student that stands out, GR, struggled with math but she was very focused on the game. I have her again this year since I have a combined grade level and it will be interesting to see how she is able to multiply when we get into that unit. She continues to struggle with single digit addition and subtraction but is more proficient in 2 and 3 digit addition with regrouping.

“Of all the games we played, Battleship Numbers seemed to be the favorite. It was the most complex in regards to rules of the game and strategy but the kids just loved it.”