Presentation 22
Math Breaks
Fun Games That Teach

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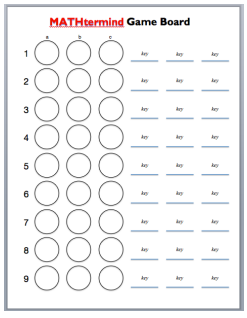
- Challenge a partner to break your MATHtermind code and learn to make your own board and variations
- What's on your mind? Literally, what's that word on your forehead? Play MATHbanz and guess the secret word on the card on your headband
- All kids should be encouraged to play Board Games and Santorini is simple enough to introduce in the classroom and engaging enough to take home to play

I. MATHtermind

Rules:
In traditional Mastermind, a player uses inference and logic to guess a hidden pattern of six colored pegs. Pair up to play MATHtermind.

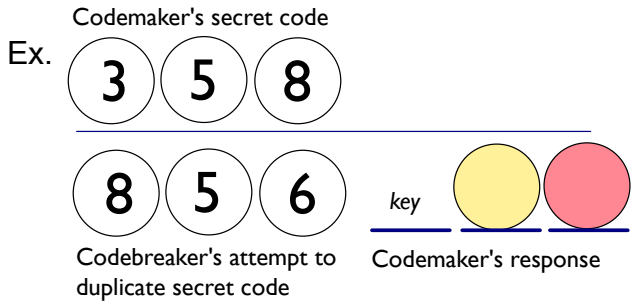
1. The Codemaker uses any digit from 0-9, without repeats, and without regard to chip color to make a 3-digit code and places it in the folded card.
2. The Codebreaker has nine tries to guess the 3-digit code of numbers the set by the Codemaker.
3. After every guess, the Codemaker responds with hints in the form of colored key counters, which signify either:



correct digit **and** correct position: 

correct digit but wrong position: 

no correct digit: *no counter at all*



Red is for the 5 being the right number in the right position, Yellow is for the 8 being the right number but in the wrong position. The keys do not indicate which positions they refer to.

Use a folded index card to hide the 3-digit code. Labeling the circles makes it easier to figure out which circles correspond across a desk. I use clear plastic 1 inch counters and write numbers on them with sharpie paint pens to up the challenge. Make sure you mark underlines to indicate the 6's apart from the 9's. Two color counter chips work well for the key codes.

Math variations:

- Create a Color Code using the six colors instead of numbers
- Use Math Symbols instead of numbers: $\pi, \infty, \theta, \sqrt{\ }, \neq, \leq$
- Use Shapes instead of numbers: 
- Add a 4th digit to the code. Now, allow the Codebreaker 10 guesses to try and crack the code.

II. MATHBanz

Rules:

In the traditional popular game Hedbanz, players race against time to see who can use deductive reasoning to guess what's on the card on their head. The first to get rid of three tokens wins. Get in groups of 6-8 to play MATHBanz.

1. Place all the cards face down in the center of the playing area.

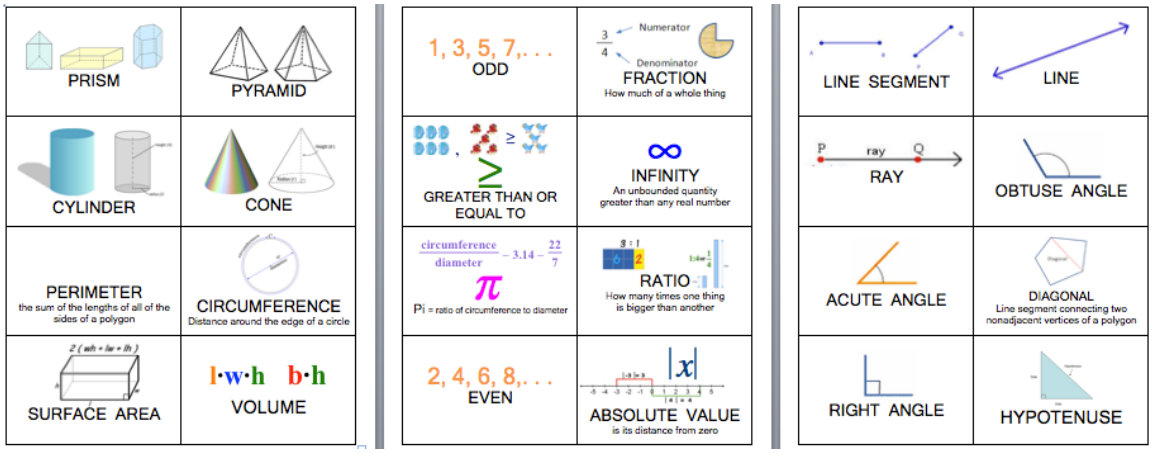
2. Each player puts on a headband and chooses a card. Without looking at the picture or word side of the card, players insert the card into the clip of their headband so all the other players can see the picture or word.

3. On your turn, ask the other players in your group a YES/NO question that will help you identify the card in your MATHBanz.

4. For each card you guess correctly, get a token. If you do guess correctly, remove your card and put it aside, take another card, and continue playing.

5. At any point during your turn you may give up. You have to pay one token, and are dealt a new card for the next round.

Ex.



MATHbanz is a fun way to review concepts for a test, or practice new vocabulary. I find that since the whole group spends time and thought inspecting the cards in order to answer the player's questions, more players learn the concept than just the player with that concept on their head. Therefore, it seems worthwhile to invest a bit of time to write out a concise definition for each Common Core Standards concept illustrated on the MATHbanz cards.

To make the game more positive, I reward each correct guess with a token, and let them collect them to tally how many cards they guessed correctly. Usually, my students are not really concerned with the tokens and just like to play for the fun of it.

MATHbanz Variations:

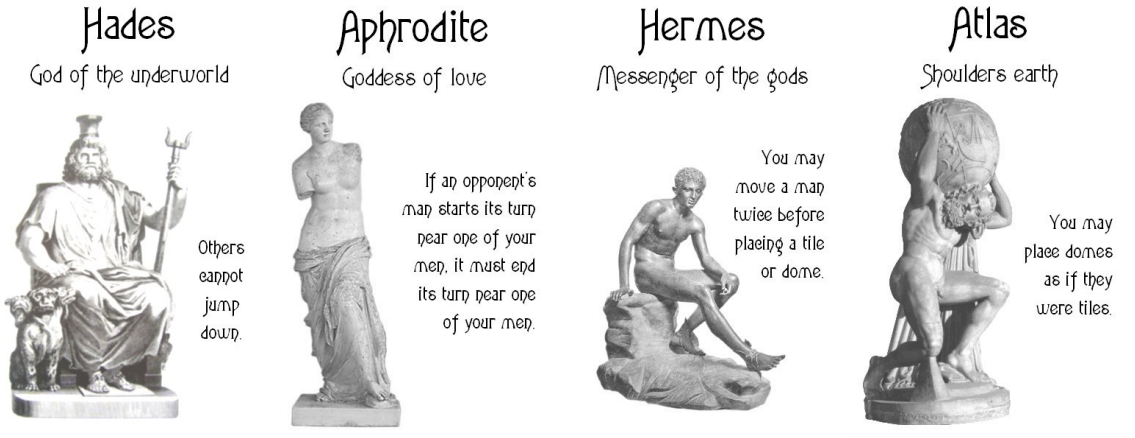
- Guess the 3-digit number
- Provide a vocabulary list with all of the possible words in order to narrow down choices
- For an easy, economic version, write the words on notecards and stick them on students backs
- Make paper headbands and use a large paperclip to attach cards
- Use a large elastic headband and tuck an index card under it in front

III. Santorini

Board games provide a rich resource of fun natural problem solving. Encourage your students to embrace a culture of gaming at home and introduce this easy to explain and simple to play strategy game to them in the classroom. It fulfills the requirements of being robust, cheap to make, easy to learn, and fast-to-play, but it also stands up well amongst the legions of gamers as an elegant and enticing game of strategy. As with the other two games, the game pieces themselves are attractive, fun to hold, and encourages play.

Rules:
Get your Game Piece to the Third Level to win.

Use optional god cards for more advanced play:
Ex.



The basic game can be extended by adding **Gods** and **Heroes,** which alter the rules of the game (as gods are prone to do). The tricky bit is that each player chooses his own God from a selection, so not all gods are available, and players might be following the same or different gods.

Summary

- MATHtermind and MATHBanz can be customized to suit your curriculum and to model CCSS objectives. Make it positive and give tokens for correct guesses.

- Mancala, Egyption Ratscrew Card Games, and Pentominoes are all easy to make or cheap to buy. Get a classroom set!

- Gnomes in Hats/Gnomes in a Line introduces parity puzzles and is fun to act out in a classroom together using simple stickers or paper hats.

- Utilize computational games for embedded skills practice that are provided free daily such as the NYTimes KENKEN. These puzzles are much more motivating and engrossing than worksheets, and far less work for you

- Encourage a culture of gaming both in the classroom and at home and embrace the rich worlds of problem solving and strategizing that occur naturally in these fantasy environments.

Appendix I - CCSS Grade 6

Grade 6 Overview

Ratios and Proportional Relationships

- Understand ratio concepts and use ratio reasoning to solve problems.

The Number System

- Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
- Multiply and divide multi-digit numbers and find common factors and multiples.
- Apply and extend previous understandings of numbers to the system of rational numbers.

Expressions and Equations

- Apply and extend previous understandings of arithmetic to algebraic expressions.
- Reason about and solve one-variable equations and inequalities.
- Represent and analyze quantitative relationships between dependent and independent variables.

Geometry

- Solve real-world and mathematical problems involving area, surface area, and volume.

Statistics and Probability

- Develop understanding of statistical variability.
- Summarize and describe distributions.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.

Appendix II - CCSS Grade 7

Grade 7 Overview

Ratios and Proportional Relationships

- Analyze proportional relationships and use them to solve real-world and mathematical problems.

The Number System

- Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Expressions and Equations

- Use properties of operations to generate equivalent expressions.
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Geometry

- Draw, construct and describe geometrical figures and describe the relationships between them.
- Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Statistics and Probability

- Use random sampling to draw inferences about a population.
- Draw informal comparative inferences about two populations.
- Investigate chance processes and develop, use, and evaluate probability models.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.

Appendix III - CCSS Grade 8

Grade 8 Overview

The Number System

- Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations

- Work with radicals and integer exponents.
- Understand the connections between proportional relationships, lines, and linear equations.
- Analyze and solve linear equations and pairs of simultaneous linear equations.

Functions

- Define, evaluate, and compare functions.
- Use functions to model relationships between quantities.

Geometry

- Understand congruence and similarity using physical models, transparencies, or geometry software.
- Understand and apply the Pythagorean Theorem.
- Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

Statistics and Probability

- Investigate patterns of association in bivariate data.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.