Erikson Institute

Early Math Collaborative

Play & learn together!

Games engage ALL children and families in math thinking

Workshop led by Donna Johnson and Veronica Castro

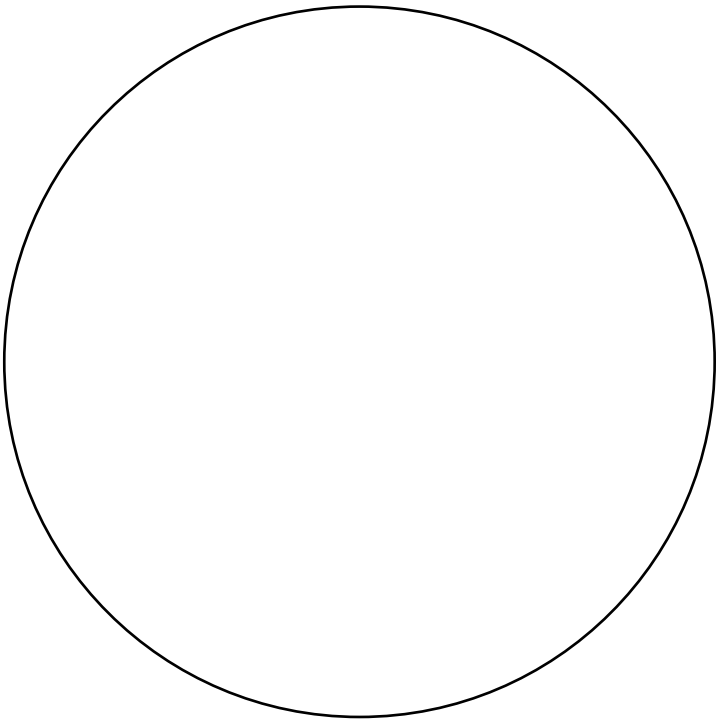
26 June, 2020

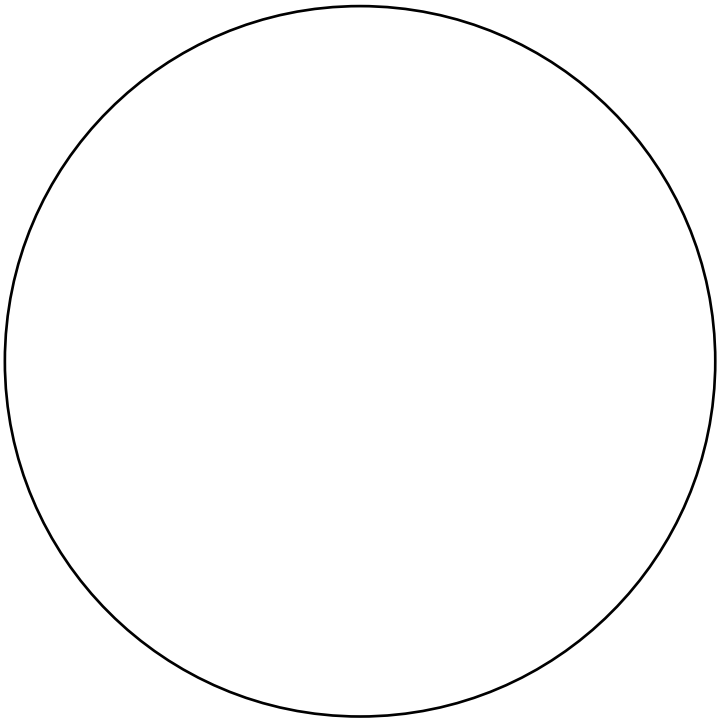
Agenda

- Let's play!
  - NIM
- How do games grow mathematicians?
- What games can we play with quantity cards?
- Let's play some more!
  - 1 through 10
  - magic 10
  - match / make a number
  - salute
- Games build understanding of number relationships
  - spatial arrangements
  - one & two more / one & two less
  - benchmarks of 5 & 10
  - part-part-whole

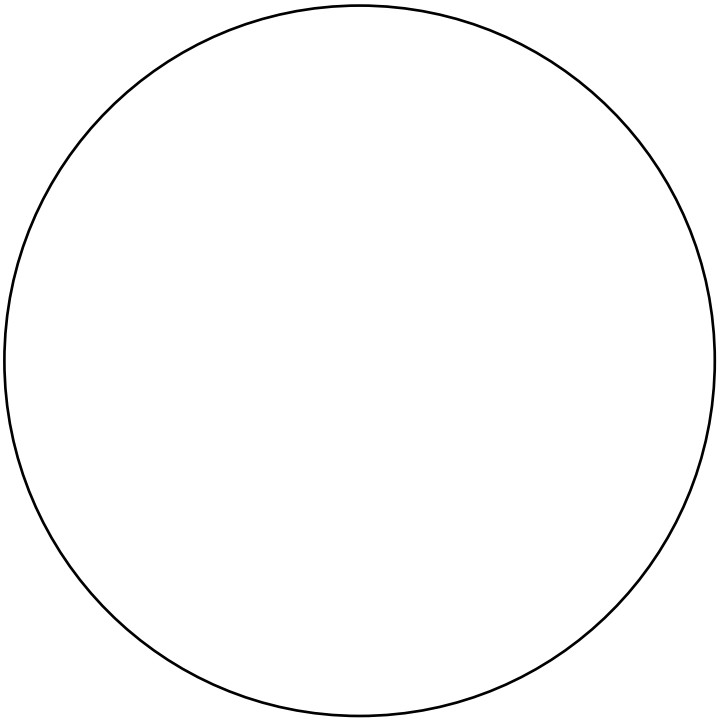
Questions? Contact us: DJohnson@Erikson.edu
VCastro@Erikson.edu

Find more early math resources at EarlyMath.Erikson.edu





**Jot down ideas
you want to remember,
questions
& other thoughts circling in
your head.**



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Let's play and learn together! *Games engage ALL children and families in math thinking*

Donna Johnson and Veronica Castro

June 26, 2020

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Let's Play!

The Game of NIM

The rules are simple:

- Start with 15 counters.
- On each turn, choose to take 1, 2, or 3 counters from the pile.
- Whomever is forced to take the last counter, *loses*. (This is a "poison-pill" style game.)

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What's a Math Game?

Math games:

- involve a challenge, usually against one or more opponents
- are governed by a set of rules and have a clear underlying structure
- normally have a distinct finishing point
- have specific mathematical cognitive objectives

(Oldfield, 1991)

Benefits of Using Math Games

Motivation

- Meaningful situations for the application of mathematical skills
- Children choose to participate and enjoy playing
- Opportunity for building self-concept and developing positive attitudes towards mathematics, through reducing the fear of failure and error

Benefits of Using Math Games

Access

- Few language barriers
- Build independence—children can work independently of the teacher
- Build home/school connections when families are encouraged to play games at home
- Increase exposure to math

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Benefits of Using Math Games

Increased Learning

- Allow children to operate at different levels of thinking and to learn from each other
- Develop logical thinking—children test intuitive ideas and problem solving strategies
- Opportunity for assessment of learning in a non-threatening situation

(Davies, 1995)

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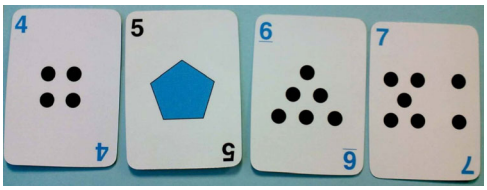
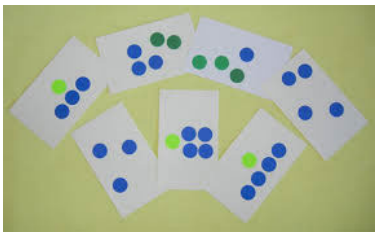
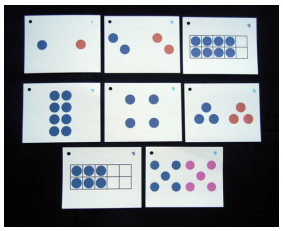
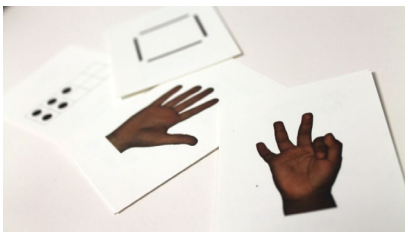
What games can we play with quantity cards?



https://earlymath.erikson.edu/new-focus-when-playing-card-games/

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Games support number relationships that build strong number sense

- **Spatial Arrangements** - recognizing how many without counting by seeing the visual structure.
- **One & Two More, One & Two Less** - this is not the skill of counting on two or counting back one, but instead knowing which numbers are one more or two less than any given number.
- **Benchmarks of 5 and 10** - since 10 plays such an important role in our number system (and two 5s make up 10), knowing how numbers relate to 5 & 10 is key.
- **Part-Part-Whole** - seeing a number as being made up of two or more parts. *(A quantity can be broken up [decomposed] into smaller parts & the smaller parts can be joined [composed] to form the whole.)*

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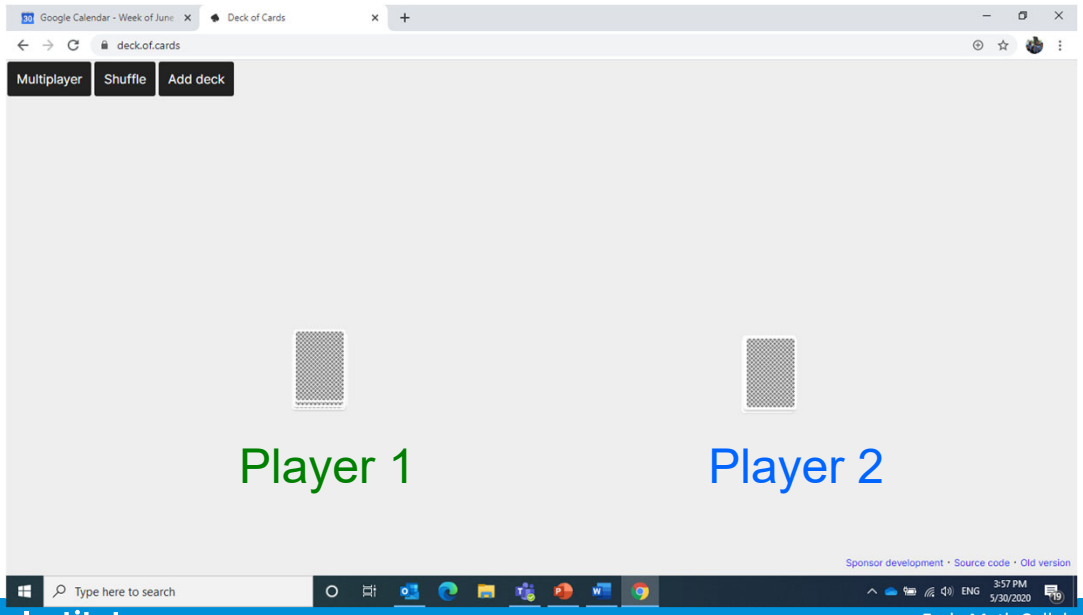
Capture (AKA War)



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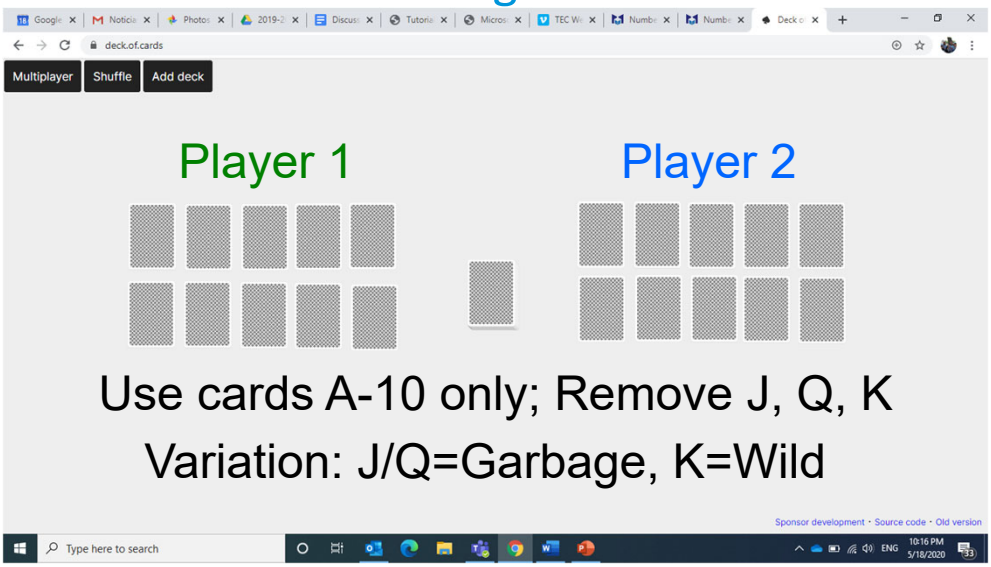
1 Through 10



Use cards A-10 only; Remove J, Q, K

Variation: J/Q=Garbage, K=Wild

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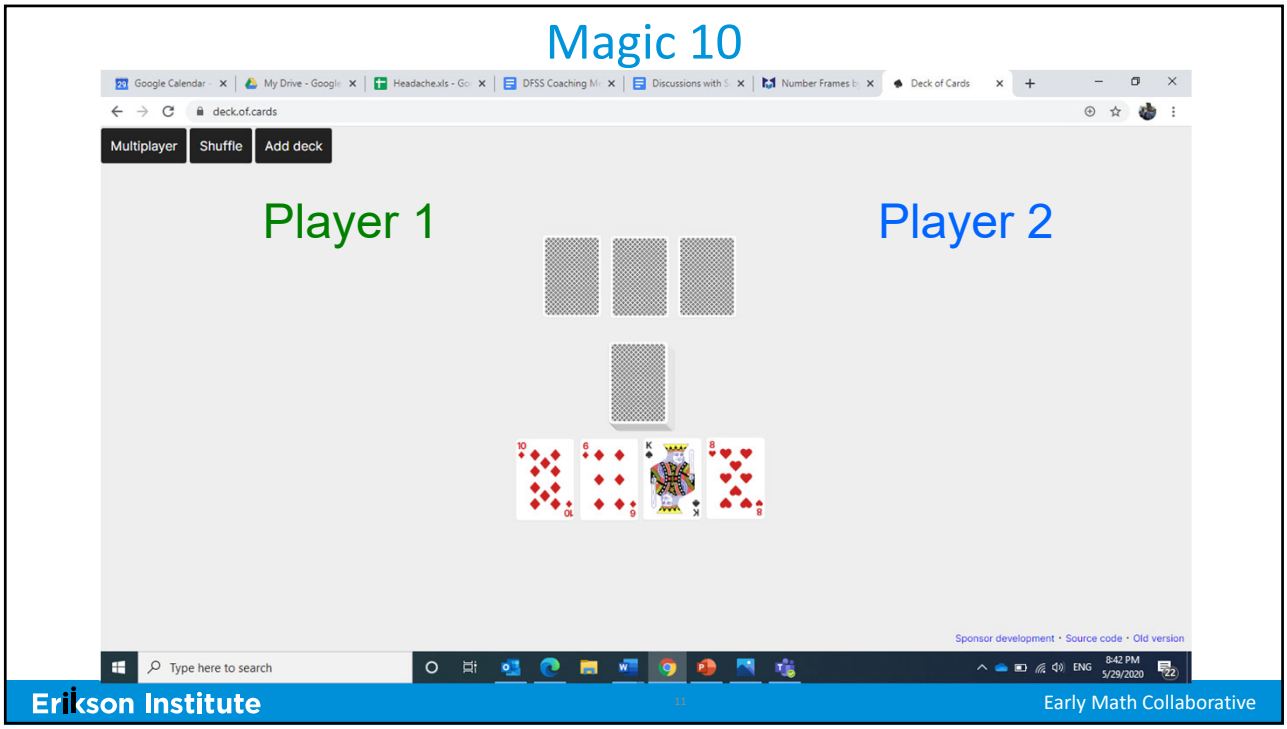
Magic 10
deck.of.cards
Multiplayer
Shuffle
Add deck
Player 1
Player 2
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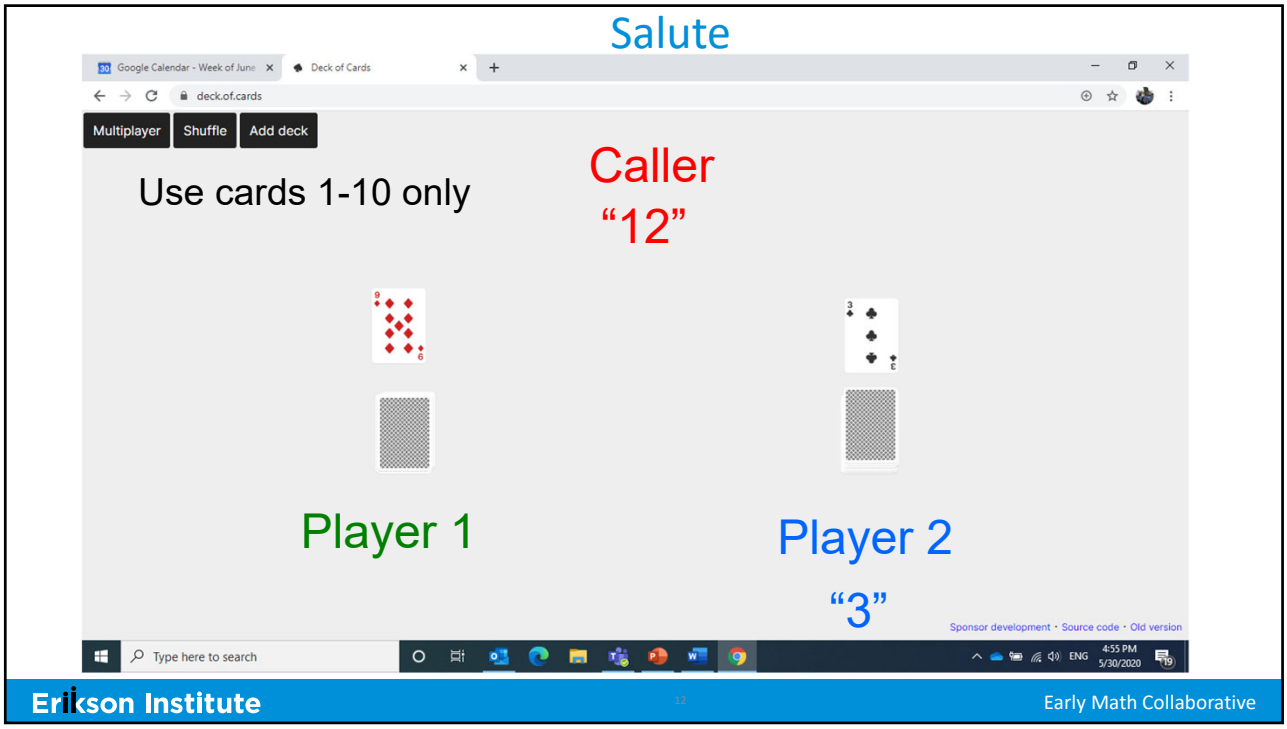
Salute
deck.of.cards
Multiplayer
Shuffle
Add deck
Use cards 1-10 only
Caller
“12”
Player 1
Player 2
“3”
Sponsor development · Source code · Old version
Type here to search
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A Thought to Ponder…

"What books are to reading, games are to mathematics!"

-Dan Finkel, founder of mathforlove.com

Find more resources at earlymath.erikson.edu

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The Game of NIM

Goal: To reason quantitatively and abstractly in order to leave your opponent with the last counter

Materials: 15 pennies or other counters

Number of Players: 2

Basic Directions:

1. Spread out the 15 pennies or other counters over the playing surface.
2. Take turns taking 1, 2, or 3 counters from the set.
3. The player who takes the last counter loses the game.

VARIATION 1: NIM Jr.

1. Start with 9 pennies or counters.
2. Take turns taking 1, 2 or 3 counters.
3. The player who takes the last counter loses the game.

VARIATION 2: NIM Pre-k

1. Start with 7 pennies or counters.
2. Take turns taking 1 or 2 counters.
3. The player who takes the last counter loses the game.

Capture

Goal: Recognize visual number patterns; compare numbers to determine the greater value, and associate number names, quantities, and written numerals.

Materials: Cards with a variety of number representations, such as numerals, dot arrangements, five-frames, ten-frames, shapes and others.

Number of Players: 2

Directions:

1. Players divide the cards evenly and place their cards face down on a pile in front of them.
2. This game is played in rounds. On each round, players turn over their top card and read the number on the card.
3. Players compare numbers to determine which card has the greater value. The player with the card of greater value "captures" the other player's card and keeps it in a discard pile.
4. Play ends when all the cards have been played. Players count the cards in their discard piles to determine which player has won the game. As a non-competitive option, play is over (and can begin again after mixing cards) when all the cards have been played.

Variations:

- Players compare cards and the player with the lesser value wins the round.
- Play Addition Capture with two cards and the player who has the greater sum wins the round.
- Play Multiplication Capture with two cards and the player who has the greater product wins the round

Magic 10 Game

Goal: To practice combinations that make 10

Materials: Deck of numeral cards 1-9 (4 of each) or playing cards with 10s and face cards removed (Ace=1)

Number of Players: Two players

Directions:

- ***Choose 3 cards at random to be put aside. These are your "magic" cards.*** Use the remainder of the deck to play.
- Lay out four cards face up. Place the rest of the deck face down to create a draw pile.
- Take turns pulling one card at a time from the draw pile. Use that card plus one of the cards in play to make 10. (2 addends only). Keep the two cards that make 10.
- If you cannot make 10, place the card you drew face up with the other cards in play. (In this way, you don't have to replenish the cards in play, because it will happen naturally.)
- When there are no more cards in the draw pile and no more combinations of 10 to make, you should be able to figure out what the 3 "magic" cards are. This is a cooperative game: <u>everybody wins if they can predict what the "magic" cards are.</u>

Variation

Because of the self-correcting feature of this game, it can be played as an individual activity.

Make a Match / Make a Number

Goals:

- Develop the big idea that quantity is an attribute of a set.
- Develop the Big Idea that small quantities can be seen and known without counting. (subitizing)
- Recognize different visual patterns and the quantities they represent.
- Find pairs of cards that combine to equal a particular number ("Make a Number" only)

Materials: ***Quantity cards*** with a variety of representations such as dot arrangements, ten-frames, fingers or tallies.

- With preschoolers start with 1, 2, 3, 4; add higher numbers very gradually.
- With kindergarteners, start with 1, 2, 3, 4, 5, 6; move to 10 as children are ready.
- With 1st graders, start with1 through 10.

Number of Players: 2 to 4

Make a Match Directions

- Depending on the number of kids playing, chose 3 or 4 or 5 pairs of cards.
- Arrange the cards face up on the table in rows.
- Players take turns finding pairs that match.
- Game ends when all pairs are matched

Make a Number Directions

- Choose a target number between 4 and 10. Remove all cards that represent the target number or more.
- Place all the cards face up. Arrange the cards in rows.
- Players find a pair of cards that combine to equal the target number.
- Play continues until all cards are gone.

Variations

- If players are proficient at finding matches or combinations face up, turn cards over and play face down, like Memory.
- Play with one player (solitaire).
- For "Make a Number," add some blank cards to represent 0, and then leave the target number in the deck.

Salute

Goal: To collect the most cards by being the first player to guess the card you are holding by calling out the missing addend

Players: 3

Materials: 40 cards total - 4 each of 1- 10 (any type of quantity card)

If using deck of playing cards, take out all face cards; ace acts as 1

Directions

1. Choose a Caller. The Caller deals out the deck of cards face down to the two players equally.
2. Players 1 and 2 face each other. The Caller is off to the side so they can see both players.
3. When the Caller says "1, 2, 3, Salute!" players 1 & 2 place the top card from their deck on their forehead so that the Caller can see it, but they cannot.
4. Player 1 & Player 2 have to figure out the value of the card on their forehead by seeing the card on the other player's forehead. The player who answers correctly first takes both cards. *Example: If player 1 is displaying a 4 and player 2 is displaying a 7, the Caller would say, "The sum is 11". Then the two players look at each other. The first player to say their missing addend (the number they are holding on their forehead) gets to keep the two cards*
5. Steps 2 and 3 are repeated until all the cards are gone. Then players 1 & 2 count their cards to see who wins.
6. Game ends when you run out of cards. The player with the most cards is the winner. Play 3 rounds so each player has a turn at being the Caller.

Variation

Salute can be played as a subtraction or multiplication game also.

Use this chart to make notes on the <u>features</u> of the games we play
& how they help children build strong number sense and fact fluency

Recommended Early Math Resources for Distance Learning

Online Curricula

The Math Learning Center: https://www.mathlearningcenter.org/home-learning
Click on your grade for fun daily math activities, collections of practice pages, family games, and online games. No login or registration required.

- PreK: Activities of the Day, Story Collections (in English & Spanish), Family Games
- K-2: Activities of the Day, Practice Pages (in English & Spanish), Online Games, Family Games
- Hidden Gem: Instructions for DIY Math Tools for Games (dice, spinners, and other random number generators)

Origo (At Home): https://www.origoslate.com/html5/36584
A set of 8 weekly, digital content plans for home use. The weekly plans contain activities for each day, along with digitally accessible or downloadable resources, designed for delivery by a caregiver or remote teacher. No login or registration required.

- PreK: Handout for families with Activities for daily household routines, Activities around the house and outside, Games, Picture book activities
- K-2: Each of the weeks provides five daily activities organized around a specific math topic. To help establish a rhythm for learning at home, each day of the week has a focus: Monday—Read and Discuss; Tuesday—Hands on Math; Wednesday—Problem-Solving; Thursday—Game Day (digital practice); Friday—Practice
- Hidden Gem: Scope and Sequence (K-6)

Finding Math in Daily Living

Early Math Collaborative: https://earlymath.erikson.edu/tag/family-math/
Family math ideas for finding math opportunities in household activities such as washing dishes, clean up time, and laundry. In English and Spanish.
Hidden Gem: DIY Cardboard Puzzles

DREME: https://dreme.stanford.edu/news/home-early-math-learning-kit-families-ideas-supporting-young-children-s-math-skills-during
A kit with easy, at-home activities for families such as recipes and tips for math in everyday moments. In English and Spanish.
Hidden Gem: Finger Counting Activities

Three-Act Tasks: https://gfletchy.com/3-act-lessons/
Video-based math problems taken from real life. Presented in 3 “acts” that are structured to build mathematical curiosity. Best for K and up
Hidden Gem: K-2 Recording Sheet

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Recommended Early Math Resources for Distance Learning

Games for Families to Play IRL

Zeno Math: https://zenomath.org/toolbox/early-learning-games/
Collection of preschool math games to play at home. Game instructions are available in Chinese, English, Russian, Somali, Spanish, Vietnamese.
Hidden Gem: Practice Math Using Any Book Cheat Sheet

Becoming a Math Family: https://becomingamathfamily.uchicago.edu/activities
Collection of simple activities and game to do with children ages 3-6. Short videos for parents demonstrate how to play and what to know about the math.
Hidden Gem: Create Obstacle Courses

Math for Love: https://mathforlove.com/lesson-plan/games/
Library of games by grade level and CCSS-M classification.
Hidden Gem: Free, printable starter deck of Tiny Polka Dot cards

Games for Young Minds: https://www.gamesforyoungminds.com/
Archive of math games, some with video demonstrations of how to play. Best for K and up.
Hidden Gem: LEGO Blindfold Build Challenge

Free Online Games for Children

ST Math: https://www.stmath.com/coronavirus (no-cost access through **June 30, 2020**)
Students progress at their own pace and engage with a series of animated puzzles that build grade-level math concepts.

Greg Tang Math: https://gregtangmath.com/games (Try: Ten Frame Mania)

Solve Me Puzzles: https://solveme.edc.org (Try: Mobiles)

Logic Puzzles: https://www.puzzle-star-battle.com (Try: Star Battle)

Free Online Math Storybooks

TumbleMath: https://www.tumblemath.com/home.aspx
Collection of math-related storybooks in short read-aloud videos with related lessons. (Try: Mouse Math! series)

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