# about this book:

When my third child, Sophie, was 4, her older siblings went through a phase of dedicated math bookwork. Sophie loved peering over her brother and sister's shoulders, but she wanted some math "work" of her own.

Her older sister patiently played with dried beans, egg cartons, dice and cuisenaire rods with her. The rods were what really grabbed Sophie, though, and she wanted more games. I was very fond of the Miquon Math program but she didn't seem quite ready to dive into that in a structured way. So she and I began experimenting with ideas for games. I began creating and then recording some of the better ones on my computer.

This booklet is the distillation of our inventions and explorations. It contains conceptual math games suitable for the K and pre-K level. They are particularly suited to children who are almost going to be using Miquon Math at the 1st grade level, because they use a similar philosophy and manipulatives.

If you wish to print and use the whole booklet, I suggest printing four copies of the flashcards on heavy cardstock, for a total deck of 48 cards. With the booklet, print page 1 on coloured cardstock, and the remainder front and back on regular copier paper. Take the booklet to a copy shop and have them cut the pages in half and punch-bind them, with the page 1 serving as a cover. The cards should be cut into 3" x 4¼" rectangles and are most durable and appealing when laminated.

Feedback?
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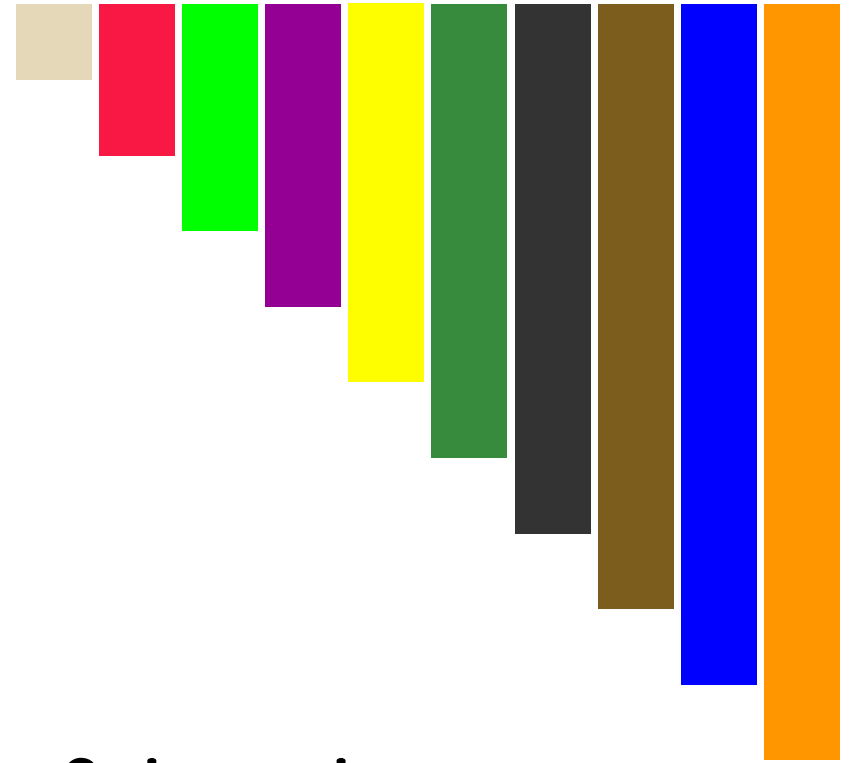
Cuisenaire Activity and Exploration Book
for pre-Miquon Kids

by Miranda Hughes
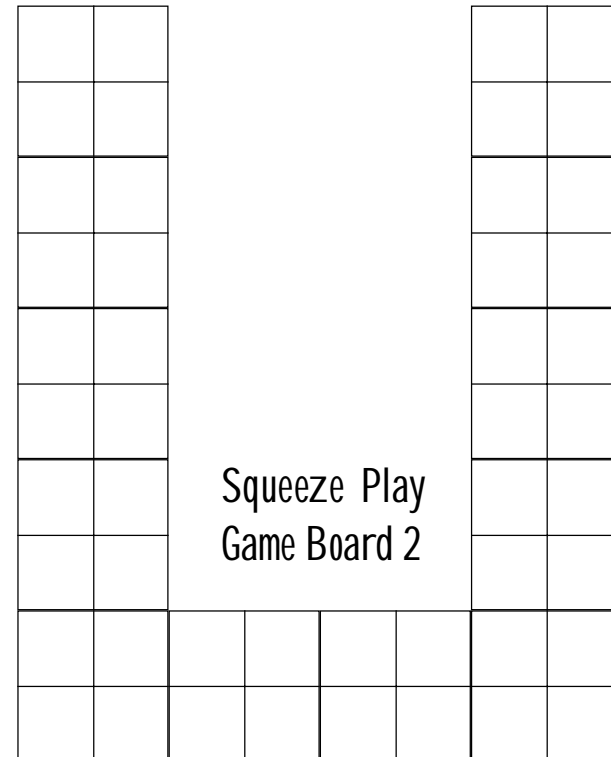
Just get the rods out. They're lovely to stack and arrange. If your child doesn't seem interested, just start playing by yourself and you'll probably find a curious pair of eyes looking over your shoulder before too long. Build a staircase or a tile floor. Make a hollow pyramid. Make squares. Stand the rods upright and make a little garden. Make a colourful four-pointed star. Give the rods "flavours" and build desserts. Put on a rod play with a standing-up yellow rod in a starring role.

Measure things with your rods. Measure your child's thumbs and fingers. Compare them to yours. How tall is a juice cup? How long is my celery stick? What is there in the house that is the same shape as a white rod? What is there that's roughly the same shape as a red rod?

Organize your rods. This is an activity that can be done over and over again. Sort them into cups or boxes. Arrange them by colour or size. Are there more whites or more reds? How many yellows make an orange? You don't have to ask or demonstrate things like this... the observations will arise naturally through play.

If they're fun to put away, they'll get put away too! We use an inexpensive fishing tackle box for ours. The top tray is shallow and the rods are easy to grab. The bottom is open and we keep a matching base-ten set in there for the older kids.
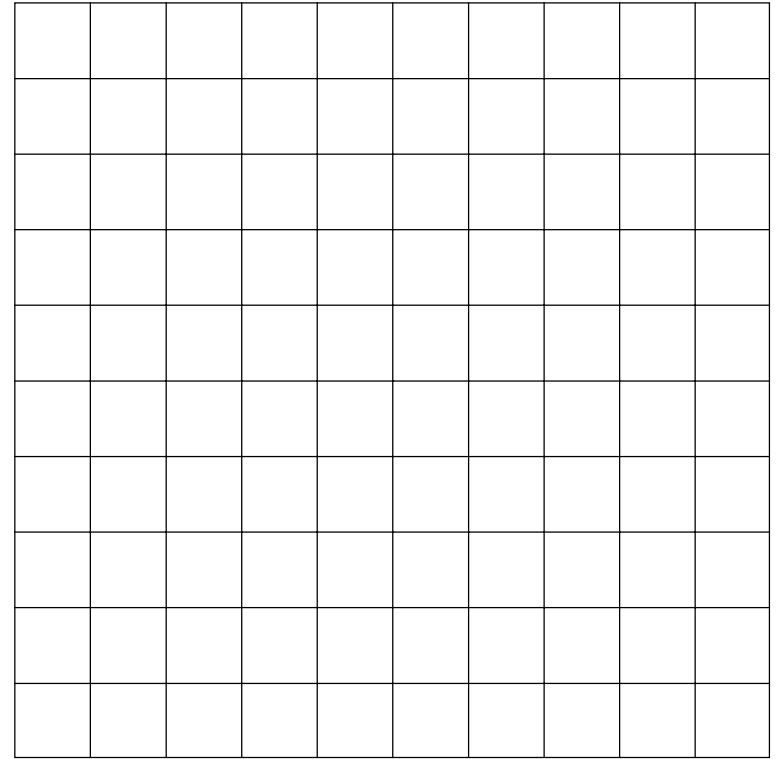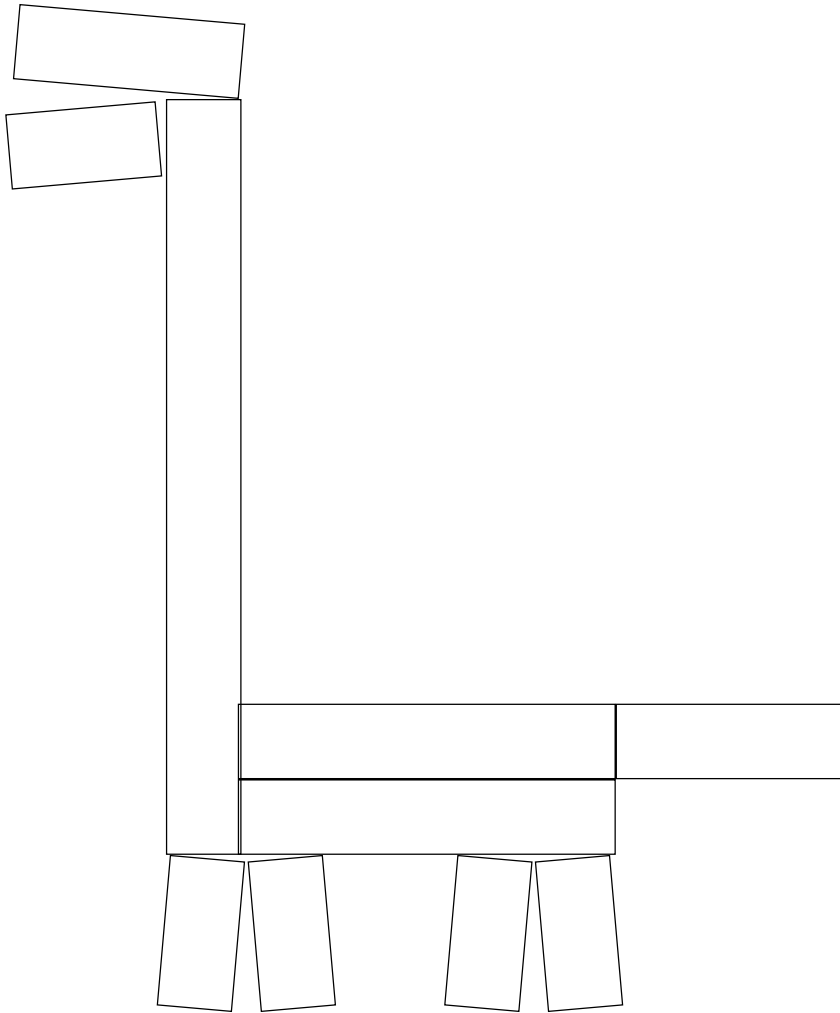
Squeeze Play
Game Board 2

Cuisenaire Activity and Exploration Book

for pre-Miquon Kids

Squeeze Play

Players: 2   **Competitive**

Materials: cuisenaire rods
                   Squeeze Play game board - see next page

Skills: 2-dimensional strategizing

Rules: Select one of the Squeeze Play game boards. Each player gets 10 rods, 1 of each color.

Players take turns placing the rod of their choice within the grid lines on the game board. The object is to be the player who places the last Cuisenaire Rod on the game board.

Squeeze Play
Game board 1
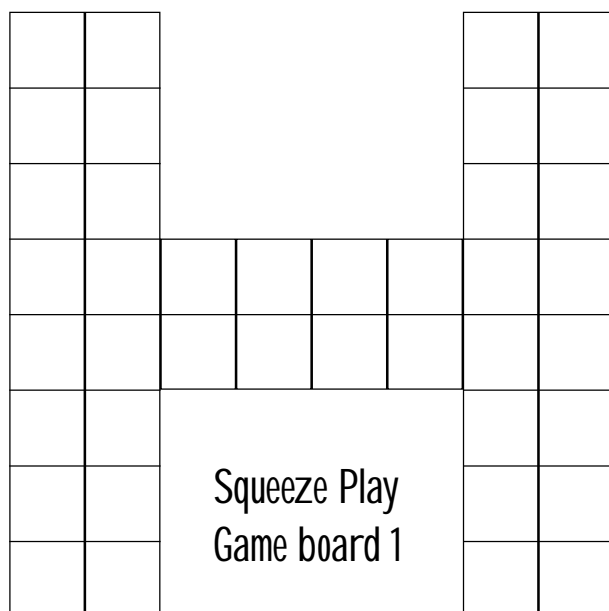
The following pages contain some pre-made rod-pictures. The idea is to place rods on matching shapes on the page. They're good for developing recognition of rod-lengths and proportions, and for developing fine-motor control.

Encourage your child to make his or her own pictures. If you have a camera you can photograph particularly appealing ones and use the photo to challenge your child to reproduce the same design later.

Encourage your child to build letters out of Cuisenaire rods to spell his or her name. Make numerals too. Can you make a "1" out of white rods? A "2" out of red rods? What other numbers can you make out of their corresponding rods?

Sailboat

Players: 2-4   **Competitive or Co-operative**

Materials: regular starter set of cuisenaire rods
              Cuisenaire Cards (with 11's and 12's removed)

Skills: simple addition
              numerical values of cuisenaire rods
              identification of pairs of rods adding up to ten

Rules: Create a rod diagram with Cuisenaire rods, depicting "different names for ten". In other words, lay out an orange rod, and beside it place (blue + white), (brown + red), (black + light green), and so on. Keep this diagram in plain view in the centre of the playing surface.

Deal out five cards to each player. Cards are laid face-up. The youngest player begins. If this player has any orange rod cards, or any combinations of two cards which equal ten, he or she picks up all such cards. Dealer replaces the cards and play moves on. If no tens or ten-pairs can be made player can do a trade of 1 or more cards with the dealer in lieu of a turn. Play continues until all cards have been dealt.

Competitive version: Person who has picked up the most tens and ten-pair cards wins.
Co-operative version: Players co-operate to make tens out of all remaining cards.

Gridlock

Players: 2-4   **Co-operative**

Materials: regular starter set of cuisenaire rods
             one six-sided die
             Gridlock game board - see next page
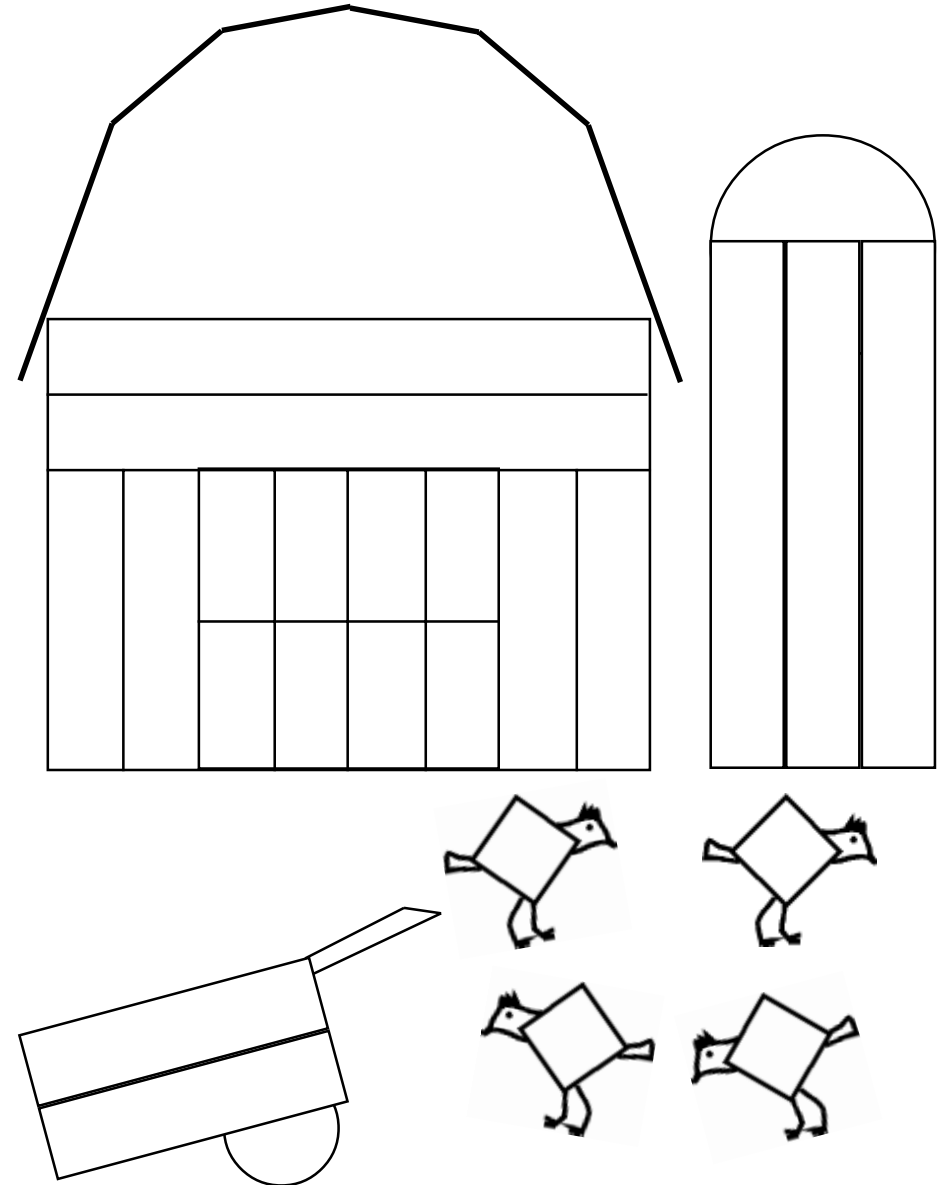
Skills: numerical values of cuisenaire rods
             2-dimensional strategizing
             introduction to area and multiplication
             familiarity with grid, pre-graphing skills

Rules: On his or her turn, a player rolls the die twice to
             determine which Cuisenaire Rods to take. The first
             roll tells "how long" a rod to use. The second roll tells
             "how many" rods to take.

             Players arrange their rods into a rectangle, place it
             on their grid. You may choose to calculate or use a
             rod track to calculate the area of the rectangle.

             The game is over when one player can't place a
             rectangle because there's no room on the grid. Then
             players count or compute how many of their squares
             are uncovered.

             Aim is to minimize this score.

Chutes and Ladders

Players: 1-4 **Competitive or Co-operative**

Materials: two of each colour of Cuisenaire rod
Chutes and Ladders Board Game (see next page)
a small token
a small opaque bag or box

Skills: number value of rods
simple strategizing
numbers to 50
counting backwards

Rules: Use token as a marker on the game board. This is traditional "Chutes and Ladders" with a twist. Rather than rolling dice to decide your move, you reach blindly into a bag or box to choose a Cuisenaire rod. The better you are at feeling the lengths of the rods and the better you know their numerical values, the faster you'll advance along the board.

Players take turns drawing a rod from the bag and moving the token forward the number of squares indicated by the rod. If the game token lands on a chute, the player must descend. If the game token lands on a ladder, the player climbs. Each rod, once used, remains out of the bag until all rods have been used. Then all are returned to the bag. To finish, you must land *exactly* on the last square. If you over-shoot, you must count backwards from the end square to count out the requisite number of spaces.

Competitive version: use multiple tokens

snakey rods

Start

End

2-Layer Rectangles

Players: 2   **Non-competitive**
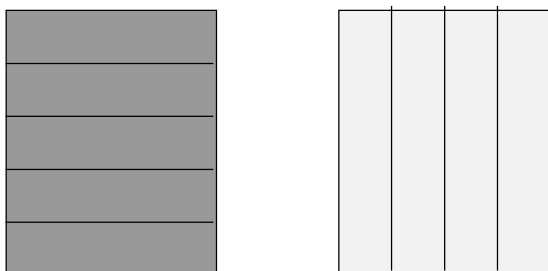
Materials: Cuisenaire Rods

Skills: counting
             familiarity with rectangle shape
             fine motor control
             multiplication terminology

Rules: One player lays out a "rectangle" of rods of identical
             length.

             The other player lays out a commutative rectangle
             on top, using rods placed at 90 degrees to the first
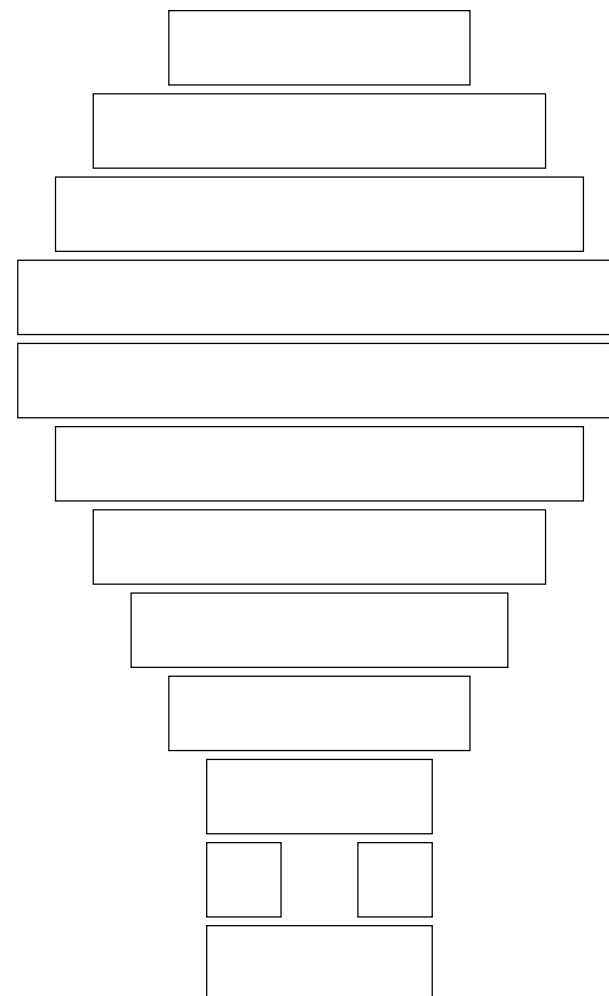   set.

             eg. first player places five purple rods side by side,
             second player places four yellow rods on top, form-
             ing a rectangle of the same shape:

If desired, "check" that the rectangles are the same
size by laying out two rod trains, one made from
each rectangles. They will be of equal length.

War

Players: 2   **Competitive or Non-Competitive**

Materials: Cuisenaire Cards

Skills: comparing rod lengths
               recognizing and naming rod values to 12
               concepts of equal, greater than and less than

Rules: Each player is dealt half the deck of cards. Both play-
               ers face off, turning over one card each. The players
               with the higher-value card wins both cards, adding
               them to the bottom of his or her stack.

               If there is a "tie", the tied cards stay face up. Each
               player adds three face-down cards, then one face-up
               card. The greater card wins the entire trick. Repeat if
               necessary for "double war" or "triple war" if further ties
               occur.

               Non-competitive version: Game ends when players
               have been through the deck once.

               Competitive version: Game ends when one player has
               won all the cards from the other. Or game ends at an
               agreed-upon time, and players count how many cards
               they each have to determine a winner.

Players: 2-4   **Competitive or Co-operative**

Materials: Cuisenaire Cards (remove "1" cards)
               two six-sided dice

Skills: counting (dots on dice)
               simple addition 2 to 12 (two dice added together)
               pattern recognition (dots on dice)
               correspondence of numerals and cuisenaire rods

Rules: Each player is dealt six Cuisenaire Cards. They are
               laid out in a row, face-up, in front of the player. Play-
               ers then take turns rolling the dice. If the number
               rolled is equivalent to the value of a Cuisenaire card
               that player has, the card is flipped over. The object
               of the game is to turn over all one's cards.

               Competitive version: winner is the first person to turn
               over all his cards.

               Co-operative version: object is for all players to turn
               over all their cards, so a player who rolls a number
               he cannot use can give his roll to a player who can.

Chutes and Ladders Gameboard

50 End	31	30	11	10
49	32	29	12	9
48	33	28	13	8
47	34	27	14	7
46	35	26	15	6
45	36	25	16	5
44	37	24	17	4
43	38	23	18	3
42	39	22	19	2
41	40	21	20	1 Start

Snakey Rods

Players: 1-4　　　　　　　　**Competitive or Co-operative**

Materials:　regular starter set of cuisenaire rods
one six-sided die (dots or numerals)
Snakey Rods game board

Skills:　fine-motor control
numeral recognition
correspondence of numerals and cuisenaire rods
visual estimation of lengths
strategizing

Rules:　To begin each player rolls die five times, selecting a rod to match each roll of die. Thus each player begins the game with a pile or five rods of value 1 - 6.The object is to use up all one's rods as soon as possible. Players take turns placing a rod on the snake path beginning at "Start." If a rod ends directly in front of a square with a number in it, that player must add the corresponding rod to his pile. If no move can be made, player rolls the die, adding the corresponding rod to his pile until a move can be made.

In the competitive version, the aim is to be the first to use up all one's rods. In the co-operative version the aim is to work together to make the shortest possible "snake", and once one player is out of rods, he or she assists the other(s) in using up remaining rods. If the snake reaches the "End" square before the game ends, the snake wins.

Players: 1-4   **Non-Competitive**

Materials: regular starter set of Cuisenaire rods
             set of Cuisenaire Cards

Skills: the concept of "sum"
             relative value of rods
             reprentation of numbers from 11-20 with rods

Rules: Player chooses a rod, then draws a card. The object
            is to make rod diagram illustrating the sum of these
            two values.

            *eg. Child chooses purple rod and draws a black rod
            card, then lines up purple end on end with black and
            demonstrates how orange and white match the sum.*

            Parent can narrate the result: "The sum of purple
            and black is orange with white. The sum of 7 and 4
            is 11."

            Other players take turns in a similar fashion.

            If children have used the Cuisenaire Cards for other
            games they will be familiar with the standard
            cuisenaire representation of 11 and 12. You can
            explain that the other "teens" are named by adapting
            the names of the rods that represent them: "five-ten"
            is "five-teen" or "fif-teen". "Six-ten" is "sixteen" and
            so on.

Players: 1-4   **Non-Competitive**

Materials: regular starter set of Cuisenaire rods
             set of Cuisenaire Cards

Skills: the concepts of "sum" and "difference"
             the different way we represent these operations with rods
             relative value of rods
             reprentation of numbers from 11-20 with rods

Rules: This game is just a combination of "Sums" and
            "Differences". With each turn the player can choose
            whether to make a sum rod diagram or a difference
            rod diagram.

Steps and Stairs

Differences

Players: 2-4   **Co-operative**

Materials: regular starter set of cuisenaire rods
                   set of Cuisenaire Cards (remove 11's and 12's)

Skills: relative value of rods
                   concepts of "equals", "greater than" and "less than"
                   strategizing

Rules: Each player is dealt six cards. These are laid face up in a row. Players take turns placing a rod matching one of their cards to create "steps and stairs" array of cuisenaire rods in the centre of the playing surface. The rods are laid parallel to each other, and each rod must be equal to, or one greater than or one less than the last one placed. Once a card is used it is removed, set aside in a common "discard" pile, and replaced from the deck.

A player who cannot move must forfeit his turn and trade one card with the deck.

The aim is to have as few cards as possible remaining undiscarded at the end of the game.

Players: 1-4   **Non-Competitive**

Materials: regular starter set of Cuisenaire rods
                   set of Cuisenaire Cards

Skills: the concept of "difference"
                   relative value of rods
                   the idea that "same" means "zero difference"

Rules: Player chooses a rod, then draws a card. The object is to make rod diagram illustrating the difference between these two values.

eg. Child chooses purple rod and draws a black rod card, then lines up purple beside black and demonstrates how light green fills in the difference.

Parent can narrate the difference shown: "The difference between black and purple is light green. The difference between 7 and 4 is 3."

Other players take turns in a similar fashion.

To reduce difficulty, it may be helpful to remove the 11 and 12 cards from the deck.

Most children see the "zero difference" scenario as a funny joke. They enjoy the coincidence of choosing