

NCTM 2015: Number Sense Magic for Pre-K – 1st Grade Students



KEY CONCEPTS

- Subitizing & Number Line Skill in pre-K and K predict later math success
- KENS screener helps predict who needs intervention
- Conceptual/Perceptual Subitizing & Number Line Skill Training develop strong number sense
- Ability to subitize 5 is key
- Playing games (linear board games, card games, foamies) reinforce number sense skill
- Circle number lines and scaffolded number lines build number sense and estimation skills
- Practice counting down and skip counting to build math skills

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QUICK GUIDE TO BUILDING A STRONG NUMBER SENSE

“SUBITE” PRACTICE (Go Cards or Technology App) (Color, Quantity, Spatial Arrangement, Time varied)



Use Leveled Flash Cards or Tablet App

Just 2-5 minutes daily practice

GO: Students answer “How Many?” when presented with an app or flash card presentation of objects. Cards or app are matched to a student’s present skill level based on pre-test assessment.

SHOW: Students model/create number with manipulatives, on paper or with technology. For example, students may demonstrate $4 + 3$ with objects.

TELL: Quick recall of math facts.

NUMBER LINE (NL) ESTIMATION SKILL PRACTICE (Correct placement on a number line)



Define NL Range Based on Pre-test
(1-5; 0-10; 0-100)

Use Dowel Rod & Bead, Ziploc Bag, Paper NL or Pipe Cleaner & Bead

Create a NL game with cards

Create a visual model: Younger students often represent numbers logarithmically (scrunched up). A visual model allows students to see equal spacing across a range. Have students practice NL placement with a guide placed behind the NL.

Find the Middle: Using simple inquiry, have students find the middle of a number line range. Then, remove the guide and ask students to find the middle and other numbers. Students check accuracy by placing their NL on top of the NL guide.

PLAY NUMBER SENSE GAMES 3-5 TIMES WEEKLY



Make copies of games and send home for parents to reinforce targeted skills. Linear board games and number card games work best.

- **Foamie Game; Sock Play; Subite Games**
- **Race to 10; Race to 100; Race to Zero**
- **Card Games: Number Wars, Number Fish, Match, Make 10**
Use playing cards (Face cards = 10) or Subite (dot) cards

INSTRUCTIONS FOR ADMINISTRATION OF KENS MATH ASSESSMENT ©2012

In several studies, KENS Math assessment accurately predicted kindergarten students who were unable to master all kindergarten math standards. It was also shown as useful and reliable tool to predict students who failed an end of the year math diagnostic test on year later ($p < 0.001$). Typically, the administration of this 3-page instrument occurs during the beginning of the school year to identify students at higher risk for math difficulties by determining a student's ability to subitize numbers to 5. Administering the KENS Math 1-minute screening test to each student is a required to determine his/her starting point in the leveled card system.

The screening test may be administered at any time during the kindergarten year.

This assessment is designed to allow students to use a previous row of dots (3 or 4) to make an educated guess for the numbers 4 or 5. This assessment tool is purposely designed to allow students to tap into their number-combination skill to achieve successful results.

PART 1

An examiner should not give praise related to a student's response until the entire test is completed.

- Show student the page with two rows of dots (the pretest page). All other sheets are turned over so the student does not have an advance peek at the dots.
- Say, "We are going to play a new game. I'm going to show you some dots. As quickly as you can, without trying to make any mistakes, I would like you to tell me how many dots are in each row."

- Point to the row with only 1 dot and say, "How many dots are in this row?"

If the student gives a correct response, point at the second row and repeat the directions with the 2 dot row, "How many dots are in this row?"

Once in a while, a student will answer three when shown the first row of dots. In this case, use your finger to sweep across the row and repeat the direction.

PART 2

If the examiner chooses, a stopwatch may be used to time the total time it takes for a student to answer the 10 rows of dots in this section.

- Show student the page with 5 rows of dots that begins with 2 dots. Say, "How many dots are in this row?" while pointing at the left corner of the row. When a student provides an answer (right or wrong), then move onto the next row. Keep track of the number of errors, and note any unusual counting practices on the sheet.

If the examiner chooses, a stopwatch may be used to time the total time it takes for a student to answer the 10 rows of dots in this section.

- Continue with the page that begins with 4 dots, following the same procedure as the page with 5 rows of dots.

The most common mistakes are made for the 5 dot array. Students often will respond 6 or 4. Typical four to five year old children can only subitize to 4. That is, they can instantly recognize and say the number of objects up to 4. An early number sense skill is required to answer a 5-dot problem. Some students will show adaptive strategies, like finger counting. While this gets them a correct response, without developing the ability to subitize, they may later be categorized at risk for math difficulties.

Students who make two or more mistakes in Part 2 are at high risk of failing to meet end of the year math standards. Students who take a long time to respond may also be at similar high risk. This does not mean that these students have a math disability.

EVALUATING THE SCORES

- **Students who make zero errors**

Most students who complete KENS Math assessment will not make any errors because they are able to subitize numbers to 5 or use adaptive means such as counting or combining numbers to derive the correct answer. In general, these students are at low risk for future math difficulties. These students may begin on **Level 3** of the program and may progress more quickly than students who make errors. The only exceptions are students who take more than 30 seconds to complete the two pages or those students who individually count each dot. These students should begin at **Level 2**.

- **Students who make one error**

Some of the students who make only one error will progress as quickly as students who made no errors. An optional additional assessment may be given to determine if a student made a careless mistake or has a skill deficit. The assessment provides a different array of dots with a concentration on subitizing the numbers 4 and 5. If the student makes no mistakes on the subsequent assessment, he or she may start on **Level 3**. Otherwise, these students may start on **Level 2** of the program.

- **Students who make 2 or 3 errors**

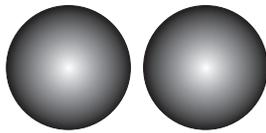
Students who make 2 or 3 errors need additional help subitizing numbers to 4 and 5. They should begin the program on **Level 1**. In addition, teachers may choose to supplement the program with intervention strategies including computer practice and additional games.

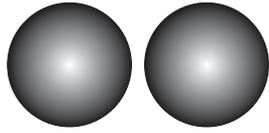
- **Students who make 4 or more errors**

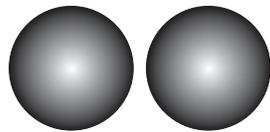
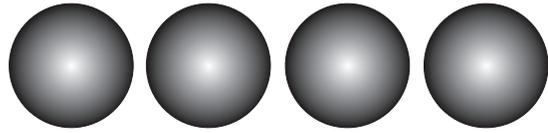
These students should begin the program on **Level 1**. Further assessment is necessary to determine if a student has the prerequisite skills for early math success. These include:

- A Counting to 10
- B Counting to 5 with one to one correspondence
- C Recognizing the written Arabic numbers from 0 – 10.

If a student is unable to complete "A," "B" or "C" then teacher-directed intervention is required to supplement KENS Math.





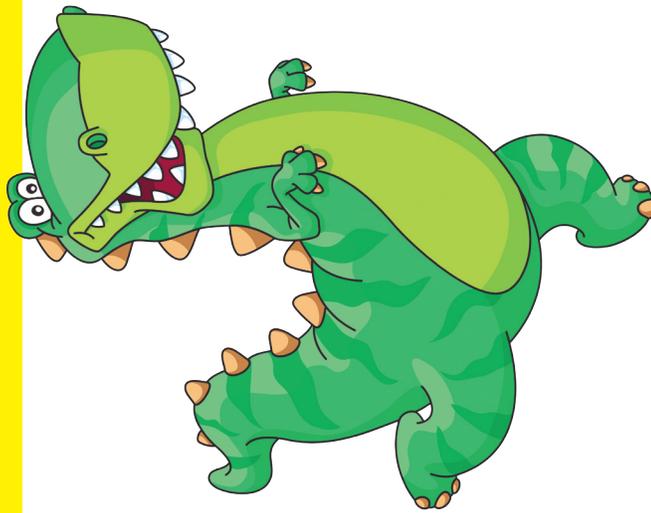


RACE TO TEN

Player 1

1	2	3	4	5	6	7	8	9	10
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START FINISH



Player 2

1	2	3	4	5	6	7	8	9	10
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START FINISH

Directions: Take turns spinning the 3-spinner and moving that many spaces. The first person to pass 10 wins.

Race to 100 (2-4 players)

Goal: To be the first student to reach 100 (or other target).

Important Note: This card game may be designed to meet the needs of students with different math abilities. Within the same classroom, one group of students may be playing to 100 or 120 while another group may play to 50 or less. The game is designed to reinforce skip counting to 10 because of the increase in the number of cards with a value of 10.

Materials: 4 sets of Number Cards (0-10), 4 sets of extra 10 cards or deck of playing cards & 100s/120s chart, tokens. Face cards count as 10.

Game Play: Shuffle all the cards (face cards count as 10). Each player draws one card to determine who goes first. The player drawing the highest card goes first. Play continues in a clockwise manner.

Each player picks one card for the deck and advances her/his token the number of spaces shown on the card. The first person to land on 100 (or target number) or more wins the game.

Advanced Play: Players are required to say the math problem, e.g., “32 and 8 more is 40!” for each turn.

Race to Zero (2-4 players)

Goal: To be the first student to reach 0 from a designed starting point.

Depending on the time available, the starting number can range between 20 and 120.

Materials: 4 sets of Number Cards (0-10), 4 sets of extra 10 cards or deck of playing cards & 120s chart, tokens

Game Play: Game play follows the same steps as Race to 100 with the important exception that students are counting down from a predetermined number. For example a student who draws a 10 with a starting point of 100, would move his or her token to 90.

Advanced Play: Players are required to say the math problem, e.g., “32 subtract 8 is 32!” after moving their token.

100'S CHART

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

The Foamie Game^{©2015}



Some of the best things in life are free or almost free. The Foamie Game is an easy almost-free way to help your child develop his or her math skills. In the Foamie Game, a parent or another child calls out a number from one to five (or higher). With five objects on a table in front of a child, he or she must “grab” the correct number of objects with **both** hands.

The Foamie Game helps children develop “number sense.” Number sense is a building block for future math achievement. Research shows that early number sense skill can predict future math achievement all the way through high school!

The Foamie Game can help your child become a math superstar by developing an important number sense skill called “subitizing.” When a child “subitizes,” he or she can instantly say how many when shown up to 4 or 5 objects. For example, a child who subitizes can see three apples in a bowl and without counting immediately say, “Mommy, there are three apples in the bowl!” The Foamie Game helps your child develop these early subitizing skills.

The Foamie Game helps children build early “brain connections.” A child who grabs two or more objects with both hands, exercises both sides of their brain while doing simple math facts. For example, to grab four foamies, a child must understand that “three” foamies and “one” more foamie makes four. With a little prompting, your child may also learn other ways to make “four” or other numbers. After a few days playing the foamie game, parents may prompt a child to provide a number sentence. For example, “Three foamies and one foamie make four foamies!”

Suggestions for how to play: A set of 6 yellow foam cylinders are included in your child’s take-home math bag. The foamie with the printed number 5 should be put aside and only used in the advanced version of this game. To begin play, place all 5 yellow “foamies” in a row with space between each foamie on a table in front of your child. Then call out a number from one to five with your child (or use 5 index cards or playing cards with a number from 1 to 5). For all numbers greater than one, remind your child to use both hands. At first, this may be difficult. But with practice, children show improvement. If your child struggles using both hands, then practice grabbing 2, 3 and 4 objects.

It is recommended that a maximum of 5 minutes be spent playing the Foamie Game. You may “race” to see who can get the correct number more quickly. (It’s OK to let your child win!) Remember to keep it fun!

Important Safety Note: The Foamie Game is not recommended for children younger than 3 or children who place small objects in their mouth. Adult supervision is recommended. Foamies may be cleaned using dish soap and water.

An Advanced Foamie Game: For children who find the original Foamie Game to be too easy, adding the “Number 5” foamie can easily challenge your child to build more advanced math skills. Using the Number 5 foamie helps your child learn how to “count on” from a number to more easily learn addition facts that are important in kindergarten.

Before playing the advanced foamie game, explain that the “5 Foamie” is the same as 5 foamies altogether. (Some parents can use the example of a nickel being the same as 5 pennies.) Another way to develop understanding is have a child make a “5” from five socks. Show your child how four socks can be “folded up” inside a fifth sock to make 5 socks altogether. Next, practice counting on from 5 by repeating the following “chant”: “Five, six, seven, eight.”

When you are ready, place the original five foamies in a row. Then place the 5 foamie” slightly above and to the left of the row of five foamies.



Before asking your child to make a number between 6 and 10, provide a couple examples of how you

would make a number by talking out loud to make your thinking “visible.” For example, you may say, “I want to make the number 8. I can start with the 5 foamie. This is 5 (touch the 5 foamie), 6, 7 and 8 (touch each of 3 foamies in a row as you count.) So, 5 and 3 more make 8.” Then collect the 5 foamie and 3 more and recount the total starting with 5. Finally, help your child make the same number until he or she is able to do so without making a mistake.

To play, use a deck of cards with the numbers Ace (1) through 10 or make your own number cards. After flipping a card, ask your child to make that number using the foamies. With a little practice, many children develop this skill quickly. As children learn this counting-on strategy, ask them to share their thinking. This will help develop more advanced math skills. For example, “5 and 2 more make 7!”

Make Your Own Foamies:

You can make your own foamies at home by taking a half or third of a sheet of paper or part of a newspaper page and crumpling it into a small ball. Larger bottle caps, buttons and other objects that are easily held in a child’s hand may also be used. To make a “number 5,” use a different color paper.

Foamies and Early Counting Games: 10 foamies in a row may be used to help children learn the counting sequence and to show one to one correspondence. In this example, asking your child to show you 6 to 10 objects, helps him or her learn the basic building blocks for mathematical understanding.

NUMBER LINE VARIETY

