



Play Games, Learn Math!

Two Numbers: Games with Cards and Dice

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“After introducing the game, we played using both guided and free play. The children really enjoyed using the dice. I observed a lot more verbalization among the children, as well as them trying to help each other learn how to play the game.”

—Elyse, Worcester, MA

Developmentally appropriate math games are playful and interactive, engaging children's attention and sparking their curiosity. Activities that tap into this natural enthusiasm promote strong mathematical thinking.

What will children learn?

Children love to play Two Numbers. Teachers love to see children having fun while practicing problem-solving skills. It's easy to adjust the difficulty level of these games by varying the number of cards or dice or by having children add (or subtract) the numbers they roll.

Two Numbers: Materials and Teacher Tips

Materials to collect

Templates for Two Numbers playing cards (and for one-page game boards) can be printed from <http://ym.edc.org/pattern-games>.

If four children play, you will need the following:

- Card game materials
 - Four sets of Two Numbers cards (cards with numerals and dice faces), 1 to 12
 - Two 6-sided dice (store-bought or make your own with a 6-sided cube and marker)
- Board game materials
 - 2 Two Numbers game boards
 - Two 6-sided dice (store-bought or make your own with a 6-sided cube and marker)
 - 48 tokens

Tips for playing

- Play these games at the math center during small group time or at circle time.
- When children first play, they will need teacher support to learn the rules. Later, they can play independently.
- Have children play in pairs after they've been introduced to the games.

Classroom management strategies

- Have children roll the dice in a tray or shoebox, so the dice don't roll off the table.
- If children get distracted by the many materials, try using the game boards instead of the cards. While children won't get practice putting the cards in the correct order, they'll benefit from seeing the numbers in order.
- It often takes players a while to roll the last few numbers they need to turn over their final cards. If children get frustrated, use one of these ways to shorten the game:
 - Include a WILD roll. If a player rolls a 1, it's WILD and can be any number, so the player can turn over any card.
 - Players can add one or subtract one from any roll.
 - Players can stop after a certain number of tries.
 - Children can play collaboratively so no matter who rolls, all players can turn over the card.

Children practice these early math concepts:

- Recognizing written numerals
 - Identifying the correct number order
 - Recognizing the number of dots in dice patterns without counting the dots (subitizing)
 - Using one-to-one correspondence when counting
 - Understanding that the last number counted tells how many (cardinality)
- Composing and decomposing numbers, and identifying the resulting number created when numbers are combined or separated

This is the big idea children practice while playing these games.

For definitions of mathematics concepts, see "Early Math Concepts Related to Numbers and Counting", at NAEYC.org/resources/pubs/tyc/oct2017/play-games-learn-math-explore-numbers.

The Two Numbers games start by having children place the cards in order. This gives them practice with creating a number line. Being able to visualize the number line will help them do better in math later on.

Game 1: Explore Number Order

Focus on recognizing quantity, written numerals, and stable counting order.

Ages 3 + / 5 minutes or longer

1. Give each child a set of cards, 1 to 6, in random order.
2. Invite them to put the cards in order—from 1 to 6—or from smallest to largest. Have children check whether they are missing any numbers.

Things to notice as children play

This first step prepares children to play the other Two Numbers games. It serves as a way to gauge the "just right" level of difficulty for each child. If a child struggles to order cards 1 through 6, then use only cards 1 to 3. If a child easily orders the cards, add more number cards or move on to the next game. As children explore, do they recognize the numerals and associate them with the number of dots? Do they associate both the numeral and the number of dots with the number word? (3, three, )

Talk to children about how they are putting the cards in order. Some children might recognize the written numerals. Others might use the dots to order them, fewest to most dots. If children need help, guide them in using the number of dots on the cards, and point out number charts in your classroom that they can reference.

Game 2: Two Numbers with One Die

Focus on counting, subitizing, and written numerals.

Ages 3+ / 5 minutes or longer

1. Give each child a set of cards, 1 to 6, in random order.
2. Play Game 1, with children putting the six cards in order.
3. Taking turns, children roll one die and turn over the card that matches the number rolled. If a child rolls , she turns over her 3 card.
4. When a child's roll doesn't match any of her remaining cards, she passes the die and awaits her next turn. (Or, children can keep rolling until they're able to turn over a card.)
5. Play continues until all the cards have been turned over.

Things to notice as children play

Some children may match the dot pattern on the card with the dot pattern they roll on the die. They are matching the dot pattern and the quantity. In this case, make sure to give the quantity a number name and point to the written numeral. With practice, children will connect the quantity with the number name and the written numeral.

“ One child who comes to mind is Elijah. I could actually see the math learning happening each time he played this game. By the end of the lesson, he was subitizing, using one-to-one correspondence, and reading numerals—and he knew some totals without counting. ”

—Andre, Woonsocket, RI



Two Numbers Suggestions and Questions

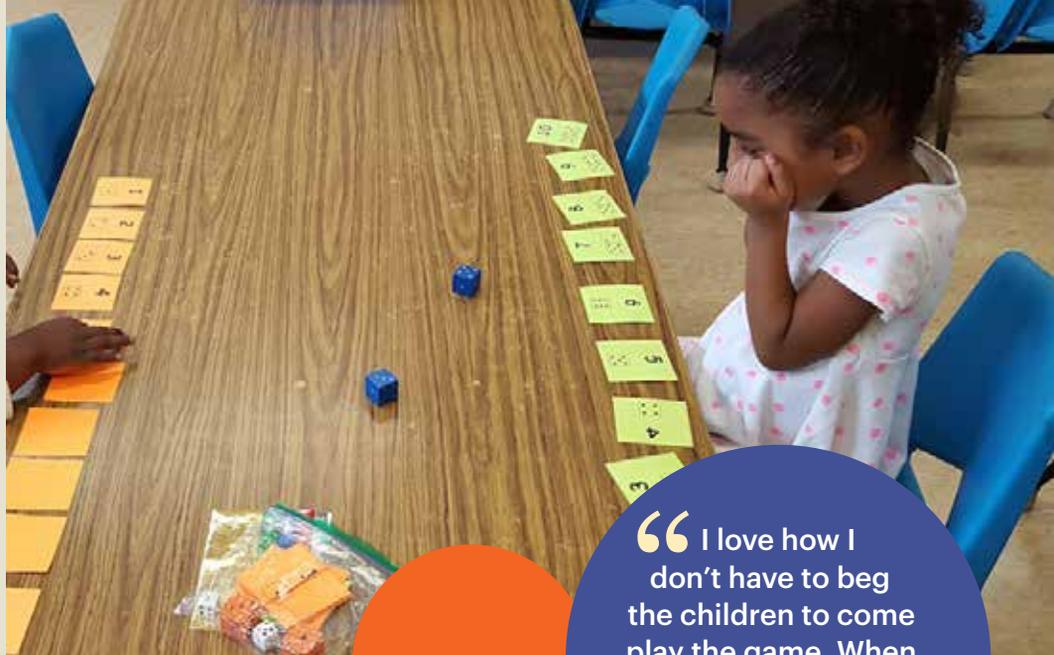
Suggestions for play

Tailor the game to your class. The goal is always for players to turn over all of their cards. Children can play

- Competitively—Players take turns rolling the dice and turning over the cards
- Collaboratively—Players take turns rolling the dice, and all players turn over cards on everyone's rolls
- Individually—A child rolls the dice and turns over his cards

Questions to ask during play

- What numbers could you roll to turn over this card? Is there another way [another dice combination] to make the number on the card?
- How many cards still need to be turned over? How many cards have you already turned over?
- Are some numbers harder to roll than others? Why do you think so?



Game 3: Two Numbers with Two Dice

Focus on counting, subitizing, cardinality, written numerals, and composing numbers.

Ages 4+ / 5 minutes or longer

1. Give each child a set of cards, 1 to 12, in random order.
2. Play Game 1, but this time children put cards 1 to 12 in order.
3. Taking turns, children roll two dice and turn over cards, based on the roll. If a child rolls $\bullet\bullet$ and $\bullet\bullet$, he can turn over his 4 and 5 cards, or their sum—his 9 card.
4. When no more cards can be turned over, the child passes the dice and awaits his next turn. (Or, children keep rolling until they can turn over a card.)
5. Play continues until all the cards are turned over.

Things to notice as children play

Some children may count each dot, one by one, to reach the total number they rolled, while others may add the numbers quickly. Some children may require support to count accurately, looking to you to count with them.

As children gain more experience, encourage them to “count on” from the larger number. That is, if they roll $\bullet\bullet$ and \bullet , they start from 4 and count on: 5, 6. Counting on from a larger number is an important skill that will later help them add numbers. If a child needs more support, play with only numbers 1 to 10. If a child is ready for more of a challenge, add a third die. Children could add $2+2+4$ and turn over the 8; or turn over the 2, then add $2+4$ and turn over the 6. There are lots of creative ways to play with the numbers.

“ I love how I don't have to beg the children to come play the game. When I say it's time to play, they cheer. ”

—Lydia, Nashua, NH

ENGAGE FAMILIES IN MATH

Send home game boards and instructions so families can play new games at home. At the link www.ym.edc.org, you'll find different printable game boards. Two bilingual Spanish/English math minibooks with instructions can be printed from http://youngmathematicians.edc.org/picture_book/roll-one and http://ym.edc.org/picture_book/roll-two. These are great resources for your classroom!

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Progression of Number Concepts for Young Children

The lines between columns are intentionally fuzzy because the age is approximate. This progression is not to be used as an assessment or checklist, or to judge whether a child is ready to transition to Kindergarten. They represent expectations for children, but each child will reach these indicators at their own pace and in their own way. These are meant to help you know what to expect; what learning may come first and what learning may come next for most children.

	~ 3 years old	~ 4 years old	~ 5 years old	~ 6 years old (end of kindergarten)
Verbally count	Recites number names to 10 with occasional errors	Recites number words to 20, with occasional errors most likely in the teens	Recites number words to 40, with occasional errors most likely in the teens	Counts to 100 by ones and tens
Count objects	Uses one-to-one correspondence for small groups of objects (under 5)	Uses one-to-one correspondence when counting (up to 10 objects)	Uses one-to-one correspondence when counting (up to 15)	Uses one-to-one correspondence when counting (up to 25)
Cardinality	Begins to understand that the last number tells the number of objects in a group	Understands that the last number name said tells the number of objects; begins to count out objects up to 5; tells the number of objects counted for small numbers (<6)	Understands that the last number name said tells the number of objects counted; can count out objects up to 10	Counts to answer how many for up to 20 objects arranged in a line, array, or circle, or up to 10 in a scattered configuration; can count out n objects up to 20
Subitize	Begins to recognize the number of objects in a group of two or three without counting	Quickly sees how many for 1, 2, and 3 objects; may begin to subitize visually or conceptually up to 5 objects (by seeing 2 and 3)	Quickly sees how many with 1-10 objects when they are in a familiar arrangement; uses chunking for numbers 6-10 with a 5 group (array, fingers, dice pattern)	Quickly sees how many with 1-10 objects when they are in a familiar arrangement; uses chunking for numbers 6-10 with a 5 group (array, fingers, dice pattern)
Read and write numerals	Identifies numerals as being different than letters and identifies some, such as 3	Reads numerals 1-5; may begin to write numerals	Reads numerals 1-10, begins to write numerals	Reads and writes numerals 0-20
Compare numbers	Uses language to compare the number of objects in two groups (<i>more, less, same</i>)	Begins using strategies to find which is more for two numbers ≤ 5	Uses counting to find which is more for two numbers ≤ 5 ; uses the words <i>less (fewer) than/more than/same as</i>	Identifies whether the number of objects in one group is greater than, less than, or equal to another group of objects; compares two written numerals between 1 and 10
Composing and decomposing numbers	Knows the whole is bigger than the parts, but may not know by how many	Beginning to know number combinations up to 4 or 5 (4 has 3 and 1 in it)	Uses objects or fingers to decompose numbers <5 into its parts (5 has 4 and 1 inside it); names parts of numbers up to 5	Decomposes numbers to 10 into pairs using objects, drawings, and/or equations. Knows the pairs that make 10. Fluently adds and subtracts within 5.