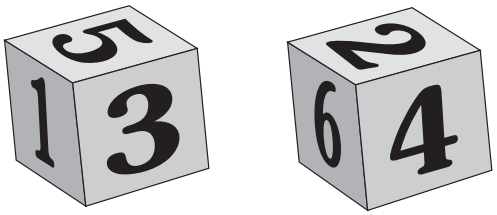
Using Number Cubes

Your kit contains
one set of ManipuLite® Number Cubes, with numerals 1 through 6.



Number Cubes, boldly printed with the numerals from 1 to 6, can be used in a wide range of activities throughout the K–6 mathematics program. They are available in ManipuLite or plastic.

The following materials will enhance mathematics instruction.

Number Cubes (Set of 4)
ManipuLite Number Cubes (Set of 6)
Overhead Number Tiles, 0–9
Overhead Number Tiles, 1–100
Overhead Number Dice, Set of 2

Common Uses of Number Cubes

To engage students in

- rolling a number cube, moving a marker the number of spaces shown on a game board, and naming the shape on the space. Alternately, students might use a game board with numbers on it and add 20 to the number written on the space. Game boards with fractions or decimals can be used by students to practice naming an equivalent fraction or decimal for the number written on the space.

- tallying sums or making a bar graph to show sums obtained in the roll of two cubes. Students might be asked: *What's the least sum possible?* [2] …*the greatest?* [12] *Are all sums between these two numbers possible?* [yes].

- rolling two or three number cubes and using different operations to get close to a given target number. For example, if the target number is 25, rolling a 3, a 6, and a 5 comes close [23 or 27].

- rolling a number cube to determine moves across or down from a start number on a Hundred Chart and then mentally adding the starting and ending numbers.

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

For instance, if the marker is on 76, and students roll a 3 on the first cube and a 5 on the second cube, they would move three spaces to the right (i.e., to 79), then five spaces down (moving to the top of the column when they run out of numbers at the bottom) to 29. They would then add 76 (the starting number) and 29 (the ending number) for a total of 105.

Colossal Counting

Manipulative: Number Cubes
Counting—Grades K–2

Focus

Students will explore, count, and compare numbers.

Grouping: Whole class, then pairs

Materials: Overhead projector, a transparency of the *Colossal Counting Activity Sheet* (page 114), reduced to fit on the overhead screen
For each pair of students: one number cube, at least 40 PopCubes® or counters in one color and 40 in another, one copy of the *Colossal Counting Activity Sheet*

Warm-Up

Display an overhead transparency of the Colossal Counting Activity Sheet. Demonstrate placing a marker on "start," rolling a Number Cube, and moving that number of spaces on the game board. Take the number of PopCubes or counters named on the space you land on.

Have students step up to the overhead and practice moves.

Warm-Up

Observe students carefully as they practice this activity during the *Warm-Up*. You may need to demonstrate a move several times and give students an opportunity to practice the first three steps before adding the fourth step and playing independently.

Explore

Now have students play the game in pairs. If students use PopCubes to keep track of the numbers they landed on, have them take a different color of cube for each turn. If other counters are used to keep track, have students keep them separate for each turn. When both students have reached the end of the board, ask them to compare their numbers of PopCubes or counters.

Variation: Students may use graph paper, tally marks, or addition sentences to keep track of their scores.

Explore

This *Explore* activity allows you to assess your students' ability to count accurately both in moving on a game board and as they collect the appropriate number of PopCubes or counters. Possible assessment questions:

- ➤ *I notice that you collected six cubes in one turn and four cubes in another. Which is more?*
- ➤ *How do you know?*
- ➤ *Both of you have completed three turns. Who do you think has more cubes now?*
- ➤ *By looking at your collection, can you estimate how many you have so far?*

Colossal Counting

Manipulative: Number Cubes
Counting—Grades K–2

Reflect and Connect

Discuss the following:

1. Who do you think has more cubes/counters? Why? To find out, make trains/stacks of ten. How many tens do you have? How many are left over? How many is that altogether?
2. Does either player have at least ten more cubes than the other one does? How could that have happened?
3. Rosa and Matthew are playing the Colossal Counting game. If Matthew rolled a 3, a 2, and a 5 on his first three rolls, what collection would he have so far? If Rosa rolled a 4, a 2, and a 6 on her first three rolls, what collection would she have? Compare the two collections. Who has more? How much more? Write a number sentence for each collection.

Writer's Wrap

Have students complete the following frame sentence.

*I have a collection of*_____*and*_____*.*

*I know that I have a total of*_____*because*
_____.

Teacher's Reflections

When can I use this activity?

Notes from trying this activity…

Ideas for next time…

Reflect and Connect

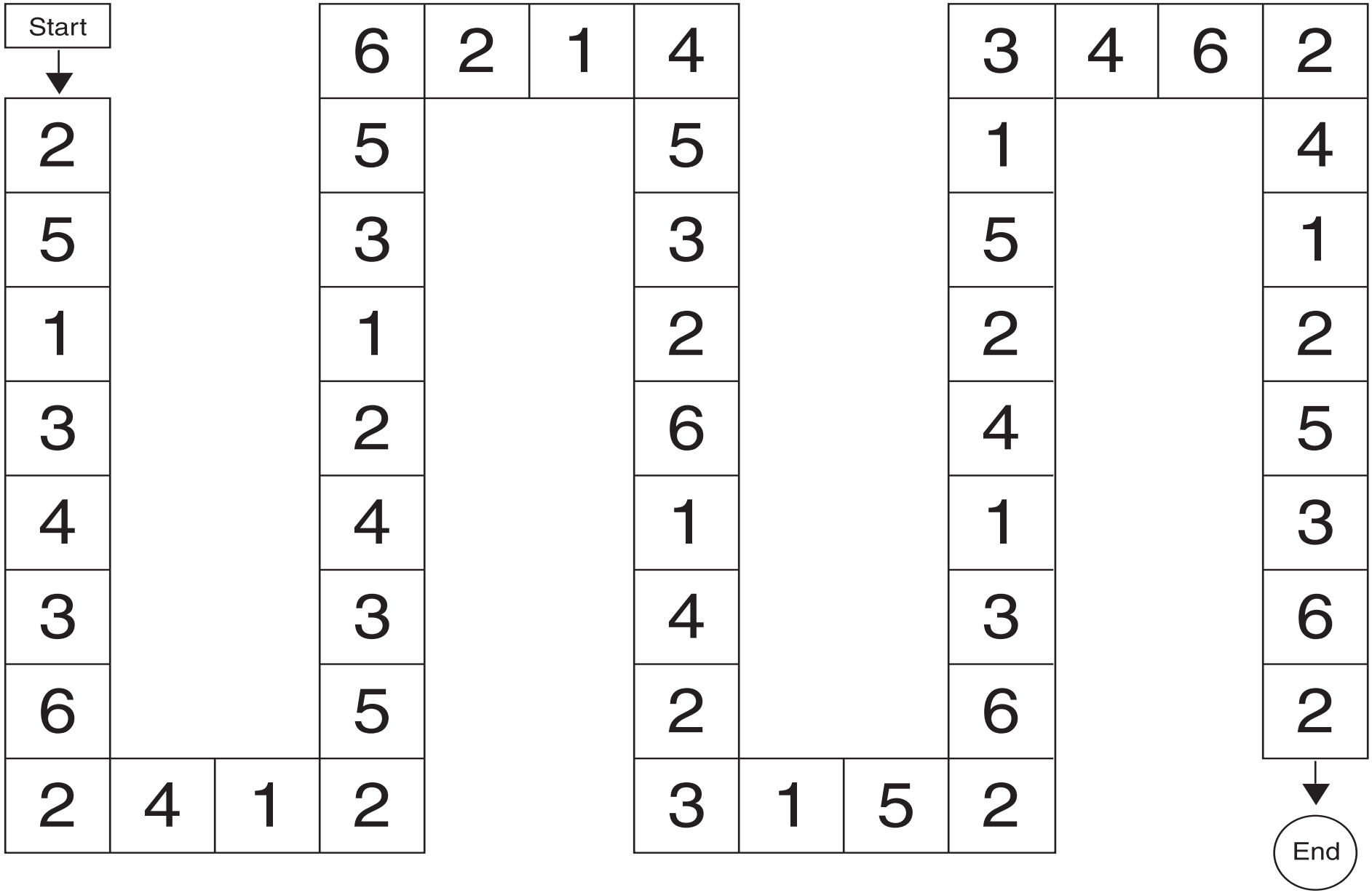
1. When students compare collections, see whether they can estimate who has more just by looking at their cubes or if they begin to count them. If students count, are they able to count accurately? Do they count by ones or by twos? Can students group by tens accurately?
2. Any player with at least ten more cubes than the other landed on higher numbers on the game board. The numbers rolled on the cube do not have anything to do with the size of the collection.
3. Matthew would have a collection of 1 + 4 + 1 = 6 (or 6 cubes). Rosa would have a collection of 3 + 3 + 5 = 11 (or 11 cubes). At this point in the game, Rosa has five more cubes/counters than Matthew.

Writer's Wrap

Frame sentences provide a structure for very young students to write and explain their thinking. Kindergarten students can dictate their responses to an adult or older student. As soon as possible, students should be encouraged to write their own. (Do not be overly concerned with spelling at this stage.)

Name_____ Date_____

Colossal Counting Activity Sheet



Chance Encounters!

Manipulative: Number Cubes
Probability Comparisons—Grades 3–6

Focus

Students will determine and compare the chances of events.

Grouping: Pairs or groups of four

Materials: For each pair of students: 25 two-color counters, two number cubes, and one copy of the *Chance Encounters! Activity Sheet* (page 117)

Warm-Up

Invite students to work in pairs to determine the different ways in which two number cubes can be rolled. Challenge students to record their results in an organized way (for instance, in a chart, table, or tree diagram).

Tell students that they will need to refer to their chart as they play the Chance Encounters! game (described below, in *Explore*).

Warm-Up

Because each of the six numbers on the first number cube can be paired with six numbers on the second number cube, there are 36 possible outcomes from rolling two number cubes. Students are asked to list them all. The ability to recognize all possible outcomes in a chance situation is basic to making decisions about chance.

Explore

Discuss the game rules on the *Chance Encounters! Activity Sheet.* Have one pair of students play against another pair. Have each pair choose a different color of markers. Remind students that the object of the game is to get three counters in a row: horizontally, vertically, or diagonally. Encourage them to consider the chances of getting the number indicated before choosing a square.

Explore

If they intend to play the game seriously, students will examine the numbers on the unclaimed squares and consider which have the best chance of coming up on the roll of two number cubes. Watch students as they play to determine how strategic they are.

It may be useful, either before or after the game, to actually calculate the probability of rolling the numbers for several squares. The class can collaborate on this task, with each pair taking a different square and sharing.

Explain the term *quotient* as the number you get when you divide one number by another.

Chance Encounters!

Manipulative: Number Cubes
Probability Comparisons—Grades 3–6

Reflect and Connect

Discuss the following:

1a. Which squares seemed the easiest to cover? Why?

b. Do the numbers that these squares ask for have a higher probability of being rolled? Explain.

2. Did the probability of covering a particular square change as you rolled each of the cubes three times? Explain.

3. When was it better to roll for a square that may give you three in a row rather than for one that would block your opponent? Explain.

Extension: Have students make their own, similar game board.

Writer's Wrap

Ask students to name the square on the game board that they most wanted or needed to cover. *Ask: What was the chance of covering it? Did this square impact the results of the game?* Have students describe the experience in writing.

Teacher's Reflections

When can I use this activity?

Notes from trying this activity…

Ideas for next time…

Reflect and Connect

1a. Squares including a large number of combinations are generally easiest to cover. For example, there are 15 ways to get a sum above or below seven.

b. Squares with a large number of combinations have a higher probability, or chance, of being rolled.

2. The probability of rolling a particular event does not change from roll to roll. The idea, "I haven't gotten it yet, so I'm bound to" is a myth; it is often referred to as the "gambler's fallacy."

3. It can be better to roll for a square of your own rather than to try to block your opponent if your opponent is trying to cover a square that contains a number that is difficult to roll.

Extension: If students make new game boards, make them available for others to use. You might even organize a tournament of sorts.

Writer's Wrap

Students' answers will vary but will provide considerable insight into how they think about chance situations.

Name_____ **Date**_____

Chance Encounters! Activity Sheet

SUM = 7	PRODUCT < 10	**Both Even**	*Both* > *3*	Difference = 2
One > 4 Other > 2	Quotient is a WHOLE NUMBER	ONE EVEN & ONE ODD	**Sum > 7**	ONE EVEN
Both Odd	**One ODD**	**DOUBLES**	Difference ≥ 3	**Sum = 9**
Difference < 3	**Each Number > 2**	**SUM = 12**	Sum < 7	*Difference = 3*
One < 5 Other < 4	*Difference = 0*	Product > 24	**Quotient is > 2**	Product > 10 BUT < 24

Game Rules

This is a game for two teams. You will need two number cubes. Decide which team will go first.

1. At the beginning of your turn, before rolling the number cubes, announce the square you will try to cover.

2. You get three tries to roll numbers that can be used to claim the square you want. Sometimes you can add, subtract, multiply, or divide the two numbers to match what is on the square. Sometimes you look for other features of the numbers.

3. If within three tries you do not roll numbers that let you claim the square, the play passes to the other team and it becomes their turn. If you do roll the numbers that match what is on the square, you cover the square with your marker. Once a square is covered, it cannot be claimed by your opponent.

4. The first to cover three squares in a row, horizontally, vertically, or diagonally, is the winner.

Which numbers are most likely to be rolled?
Which numbers are least likely to be rolled?
How does the likelihood of rolling the numbers affect your game strategy?