

What numbers could the mystery number be? How do you know?

- › The game leader has announced that the mystery number is between 0 and 1,000. What question would you ask first? Why?

Extension

Present the following scenario for students to respond to in pairs:

The game has just begun. The number is between 200 and 800. Your partner asks the question Is it 298? What ideas could you give your partner about what questions to ask during the game? Write a note that your partner could refer to the next time he or she plays.



Get to One or One-Tenth

Why This Game or Puzzle?

In the earlier grades we give our students many opportunities to count, to use a hundreds board, and to use manipulatives to trade ten ones for one ten. As new types of numbers are introduced, such as fractions and decimals, many students do not continue to have similar opportunities. These experiences are important, as research tells us that students are often focused on whole numbers when they compare decimal numbers. Some students may consider, for example, 0.09 to be greater than 0.1 because they know 9 is greater than 1 (Roche 2005). Here, a classic game used with whole numbers is adapted for use with decimals.

Two game boards are included for this game. One focuses on the relationships among hundredths, tenths, and ones as players roll a die, choose whether to have the number represent hundredths or tenths, and then count forward that amount. The first team to get to one, without going beyond, wins the game. When using the thousandths board, players roll to reach one-tenth.

Get to One Hundredths Game Board

0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10
0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20
0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30
0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40
0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50
0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60
0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.68	0.69	0.70
0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80
0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90

Math Focus

- › Counting by hundredths, tenths, and thousandths
- › Recognizing the values of hundredths, tenths, and thousandths
- › Reading, writing, and comparing decimals

Materials Needed

- › 1 die per team
- › 1 chip per team
- › 1 *Get to One* Hundredths Game Board (page A-12) or *Get to One-Tenth Thousandths* Game Board per team (page A-13)
- › 1 *Get to One or One-Tenth* Recording Sheet per team (page A-14)
- › Optional: 1 *Get to One or One-Tenth* Directions per group (page A-15)

Directions

Goal: Move forward on the game board by tenths or hundredths (or thousandths) to reach 1.00 (or 0.1).

- › Decide which team goes first.
- › On each turn, a team’s representative rolls the die and talks with the team about whether to have the number represent tenths or hundredths (or hundredths or thousandths). That number is then counted on the hundredths (or thousandths) board, starting at 0. Players can indicate their position by counting and placing a chip on the final number.
- › Alternate turns, with each team counting on from its last number.
- › If a team cannot fully complete a count, for example, the team is on 0.97 and rolls a 4, the turn is lost.
- › The first team to reach 1.00 (or 0.1) wins the game.

(See alternative rules suggested by students in the “Tips from the Classroom” section.)

How It Looks in the Classroom

One fourth-grade teacher gives each team a laminated hundredths board and a chip so that the students can mark the outcomes of their team’s decisions. He asks, “What do you notice about this hundredths board?” After students share several observations, he asks questions to review renaming between hundredths and tenths such as *Where would you be on the board if you started at zero and counted forward until you landed on a number equal to one-tenth?* and *What is another number name for thirty-hundredths?*

He quickly divides the class into two teams, based on where the students are sitting. He also designates a leader for each team, choosing students who he knows will confer with

their teammates. The students decide the leaders will roll a die to determine which team will play first. He has the leaders roll the die on the front table, under the document camera, so that all of the students can see the outcomes. Team 1's leader, Amiti, rolls the greater number. She rolls again and the die shows six dots. She quickly returns to check with her team.

Bwan announces, "It should be tenths because that will make us more than halfway there."

Richard responds, "But maybe we should do hundredths, so we don't get stuck."

Amiti says, "Let's take a quick vote."

The group decides to move forward six-tenths. The teacher invites the current leader to choose a teammate to move the chip on the board appropriately. Teams alternate turns, and the teacher notices the students' excitement growing as both chips near 1.00. Team 1 is on 0.96 and Team 2 is on 0.93. Team 2 rolls a 6 and moves forward to 0.99. There is tension as Amiti rolls. The die lands on 4, so Team 1 chooses hundredths and wins. The students are eager to play their own games in teams composed of two players. The teacher gives them recording sheets (see page A-14) to use for one of their games so that he can learn more about their thinking.

Tips from the Classroom

- › Some students may prefer a more tactile experience. Use base ten blocks, with the flat representing one, the longs representing tenths, and the units representing hundredths, and a place-value chart to organize the materials. Ask questions such as *How can you explain why the pieces represent the numbers that they do?*
- › In the excitement of the game, a leader may simply accept a suggestion for choosing tenths or hundredths without checking with the team. Simply remind leaders of their roles when this happens.

What to Look For

- › When students move forward by tenths, do they count forward ten one-hundredths for each tenth or move down one row vertically for each tenth?
- › What mathematical understandings do students demonstrate as they decide whether to choose hundredths or tenths?
- › What level of confidence do students exhibit when choosing the value of the number? Do they make reasonable choices? Can they explain their choices?

Variations

- › As mentioned in Chapter 2, we think it is important to occasionally ask students how they might change the rules of a game. After playing this game, students made two interesting suggestions:
 - › The team that goes second should always get a last turn. Jared encouraged everyone to think about it like baseball. He explained, "You always get your last ups." All the students in Jared's class agreed to this suggestion.

- › Maxine thought it would be more exciting if you could decide whether to count forward or backward on each turn. She explained, “My team might still lose, but we’d have a chance, rather than losing when we rolled something too big.” There was mixed reaction to this suggestion, and the teacher decided to offer students the opportunity to play with or without this rule. But he encouraged the students to make the rules clear before they started a game.
- › Students can play similarly, but start at 1.00 and count back.
- › Students ready to work with thousandths can play *Get to One-Tenth*, using the game board on page A-13 and deciding whether to add thousandths or hundredths on each turn.

Exit Card Choices

- › List all the ways you could win the game in two turns.
- › What could you roll to get to 1.00 (or 0.1) in four turns? Write an equation to represent these moves.

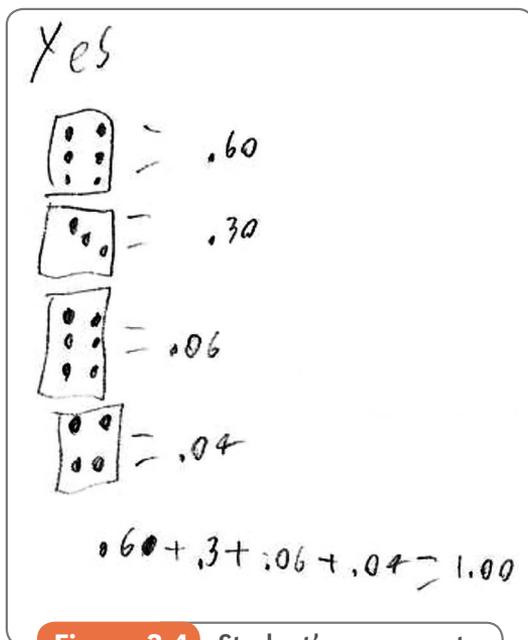


Figure 3.4 Student's response to second exit question

One student's response to the second exit question, shown in Figure 3.4, shows a range of concrete and abstract recordings. The student drew the die and recorded the decimal value of the rolls in the game. He also included an equation to show that the sum of the values was equal to one. Though the teacher understood the student's recordings with the die and the values he'd chosen for each roll, she noted that an equal sign should be used only with two quantities that have the same value. She wondered if she sometimes used this quick method of note taking as well, when she really meant “stands for” or “represents,” perhaps unthinkingly supporting this misuse.

Extension

As a follow-up, students could investigate the following activity at a learning station, through an independent activity, or on an interactive bulletin board.

Mystery Number Directions

Materials Needed

- › 1 *Mystery Number* Recording Sheet per team (page A-10)
- › Optional: 1 *Mystery Number* Directions per group of four students

Directions

Goal: Ask questions that can be answered with *yes* or *no* to identify the mystery number.

- › Decide which team will choose the mystery number and which team will try to guess it. The team choosing the mystery number also identifies a range of numbers it is between, for example, between 500 and 800 or between 0.46 and 0.875. A player on this team privately writes down the number and range and begins the game by saying, “The mystery number is between ...,” and naming the range of numbers.
- › Players on the other team ask questions that can be answered only with *yes* or *no*, such as *Is the number even?* These players record questions and conclusions on the team’s recording sheet.
- › Questions are asked until a player identifies the answer by posing a question such as *Is the number 4.7?* and having the other team respond *yes* and share what was recorded at the beginning of the game.

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0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10
0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20
0.21	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30
0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40
0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50
0.51	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60
0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.68	0.69	0.70
0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80
0.81	0.82	0.83	0.84	0.85	0.86	0.87	0.88	0.89	0.90
0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1.00

Get to One-Tenth Thousandths Game Board

0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009	0.010
0.011	0.012	0.013	0.014	0.015	0.016	0.017	0.018	0.019	0.020
0.021	0.022	0.023	0.024	0.025	0.026	0.027	0.028	0.029	0.030
0.031	0.032	0.033	0.034	0.035	0.036	0.037	0.038	0.039	0.040
0.041	0.042	0.043	0.044	0.045	0.046	0.047	0.048	0.049	0.050
0.051	0.052	0.053	0.054	0.055	0.056	0.057	0.058	0.059	0.060
0.061	0.062	0.063	0.064	0.065	0.066	0.067	0.068	0.069	0.070
0.071	0.072	0.073	0.074	0.075	0.076	0.077	0.078	0.079	0.080
0.081	0.082	0.083	0.084	0.085	0.086	0.087	0.088	0.089	0.090
0.091	0.092	0.093	0.094	0.095	0.096	0.097	0.098	0.099	0.100

Get to One or One-Tenth Recording Sheet

Name(s): _____ Date: _____

I am playing Get to _____.

We rolled _____. We give it the value of _____. Now we are at _____.

We rolled _____. We give it the value of _____. Now we are at _____.

We rolled _____. We give it the value of _____. Now we are at _____.

We rolled _____. We give it the value of _____. Now we are at _____.

We rolled _____. We give it the value of _____. Now we are at _____.

We rolled _____. We give it the value of _____. Now we are at _____.

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We rolled _____. We give it the value of _____. Now we are at _____.

We rolled _____. We give it the value of _____. Now we are at _____.

We rolled _____. We give it the value of _____. Now we are at _____.

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Get to One or One-Tenth Directions

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