

What Happens

Students play a game that involves arranging digits to make numbers that have a sum as near as possible to 100. Their work focuses on:

- ◆ finding pairs of numbers that equal 100 or near 100
- ◆ using place value
- ◆ adding and subtracting

Materials

- ◆ One deck of Numeral Cards for each group (a deck consists of 44 cards, four of each numeral — 0 to 9 — plus Wild Cards)
- ◆ Score sheet for each player (see Sample Game)

Players

1, 2, or 3

Introducing the Game

In the game Close to 100, each player is dealt six Numeral Cards — each with a digit from 0 to 9 or designated as a Wild Card, which can be used as any digit. Players arrange four of the cards to make two numbers that have a sum as close as possible to 100. To introduce the game, show the students a hand of six cards:



Ask them to suggest some numbers that could be made from two of these digits and write their suggestions down. Note that 08, which is not considered a two-digit number, is a legitimate answer. Then pose the problem:

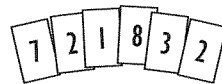
We're going to play a game called Close to 100. Pick two of the numbers you suggested — or others that you can make — and add them together. Try to get a sum (a total) as close

to 100 as possible. In fact, is there any way to get exactly 100 by adding two numbers made from these six cards?

As students are working on this problem, circulate and talk to as many as you can about strategies they are using. After a few minutes, collect a few solutions on the board. [Duplicate a blank score sheet on the board.] Explain the scoring of the game:

Your score for each round is how far your answer is from 100. Suppose you made 87 and 10: $87 + 10 = 97$, and 97 is 3 away from 100, so your score for this answer would be 3. Suppose you made 60 and 51: $60 + 51 = 111$. How far away is that from 100? (11) Your goal is to get the lowest score, so the score of 3 is better than this score of 11.

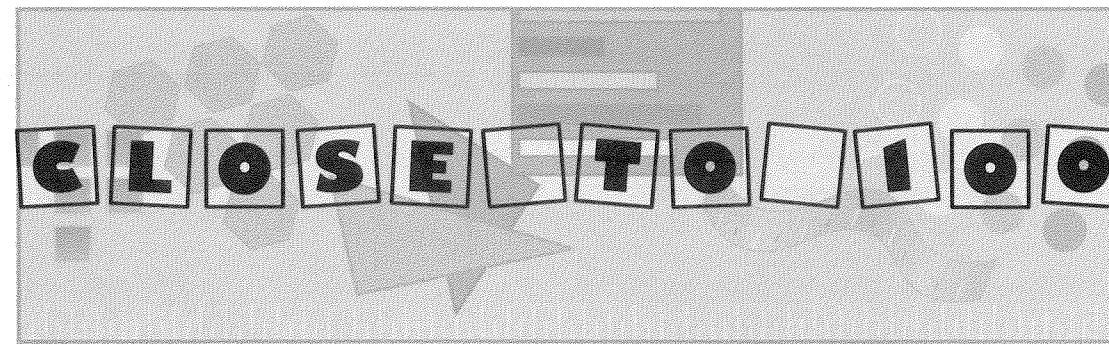
Display another set of digits for students to work with:



With this set, there are several ways to make exactly 100 ($83 + 17$, $87 + 13$, $28 + 72$, $22 + 78$). Once you think students have the idea of making two numbers that have a sum near 100, they are ready to play the game.

In Close to 100, one good strategy is to try to make 9 (90) with the tens digits and 10 with the ones digits. Students who think this way are making use of the concept of place value.

Some students may not be accustomed to thinking about strategies. Instead, they might pick digits randomly to make numbers and add them with paper and pencil as they have been taught. When you talk with these students, encourage them to estimate mentally before they do written addition.



The game Close to 100 engages students in solving mathematical problems in ways that make sense to them, talking about their work, working with peers, building models of mathematical situations, relying on their own thinking, and learning from the thinking of others. Specifically, this game places emphasis on mathematical thinking and reasoning and, most important, on mental computation. It is designed for grades 3 and 4; with variations, such as close to 20 or close to 0, it can be used more broadly. This game is one that children enjoy playing not only at school, but also in informal settings such as math clubs and at home with family members.

Sample Game

The game proceeds, and her final score looks like this:

Close to 100 Score Sheet		
Name	Luisa	
GAME 1		Score
Round 1:	$45 + 57 = 102$	-2
Round 2:	$98 + 02 = 100$	0
Round 3:	$62 + 51 = 113$	+13
Round 4:	$47 + 49 = 96$	-4
Round 5:	$85 + 06 = 91$	-9
TOTAL SCORE		28

Round 1
Luisa is dealt these cards:

She makes $45 + 57$.

Round 2
Luisa has 9 and 1 left from round 1, and is dealt

She makes $98 + 02$.

With the scoring variation, Luisa's score sheet from the sample game would look like this:

Close to 100 Score Sheet		
Name	Luisa	
GAME 1		Score
Round 1:	$45 + 57 = 102$	+2
Round 2:	$98 + 02 = 100$	0
Round 3:	$62 + 51 = 113$	+13
Round 4:	$47 + 49 = 96$	-4
Round 5:	$85 + 06 = 91$	-9
TOTAL SCORE		+2

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Playing the Game

Students arrange themselves in pairs or groups of three. Each group needs one deck of Numeral Cards, and each student needs a copy of the score sheet. [Duplicate a blank score sheet on a piece of paper and make a copy for each student.]

1. Deal out six Numeral Cards to each player.
2. Use any four of your cards to make two numbers. Wild Cards can be used as any numeral. Try to make numbers that, when added, give you a total that is close to 100.
3. Write these two numbers and their total on the score sheet.
4. Find your score. Your score is the difference of your total from 100. If your total is 98, your score is 2; if your total is 105, your score is 5.
5. Put the cards you used in a discard pile. Keep the two cards you didn't use for the next round.
6. For the next round, deal four new cards to each player. Make more numbers that come close to 100. When you run out of cards, shuffle the discard pile and use the cards again.
7. Five rounds make one game. Total your scores for the five rounds. The lowest score wins!

Let students play until they understand the game well enough to teach it to someone else.

Note: Students sometimes limit themselves by using multiples of ten whenever possible. To avoid this, you might leave out the Wild Cards when students first play, or establish a rule that Wild Cards can't be made into zeros.

Scoring Variation

Students should be comfortable with the basic game before trying this variation. The game is scored with negative and positive integers. Write the score with plus and minus signs to show the direction of your total away from 100. If your total is 98, your score is -2; if your total is 105, your score is +5. The total of these two scores would be +3. Scoring this way changes the player's strategy for the game. Negative values must be compensated with some positive ones to get a total score for five rounds that is close to 0.

Evaluating Skills

This activity is designed to give you information about your students' understanding of some critical mathematical ideas, processes, and relationships. Observe students' understanding of grouping in ones and tens in order to add. See if they are estimating by looking at the left-most digits of the numbers.

Are students able to add and subtract mentally? Do they have strategies for rearranging numbers to make mental computation easier?

Do they use a strategy, or do they try combinations almost randomly?

If they begin randomly, do they narrow down the choices to reasonable numbers, or do they try combinations indiscriminately, adding pairs of two-digit numbers until they find a sum close to 100?

Do students consider the value of numbers or do they just manipulate single digits in learned procedures? Can they recognize that $27 + 26$ is too small to have a sum close to 100, but that $72 + 26$ is close to 100?