**How Far to 100?**

In this lesson, students build a two digit number using tens frames and then investigate strategies for determining how far the number is from 100. Students will write an equation to represent their thinking.

**Common Core Standards:**

**NC.2.NBT.5** Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

**Additional/Supporting Standard:**

**Understand place value.**

**NC.2.NBT.2** Count within 1000; skip-count by 5s, 10s, and 100s.

**Use place value understanding and properties of operations to add and subtract.**

**NC.2.NBT.6**Add up to four two-digit numbers using strategies based on place value and properties of operations.

**Standards for Mathematical Practice:**

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

**Student Outcomes:**

* I can add two numbers and explain my strategy to find the total.
* I can figure out how far away a number is from 100 and explain my strategy.
* I can use place value to add numbers to 100.

**Materials:**

* Ten Frame cards – one color (These are the cards that are full ten frames. There are ten of these in a set.)
* Ten Frame cards – different color (These are the partial ten frames. There are ten of these in a set.)
* Optional: calculators, 100 boards

**Advance Preparation**:

* Before playing this game students should be familiar with combinations to 10. Students should have developed strategies for determining how far away a number is from 10.
* Students should have worked with combinations that make a ten and have discussed strategies that they use to make a ten or other number combinations.
* Students should be familiar with ten frames before playing this game. One possible preactivity is the teacher shows several full ten frames and a ten frame with 8 on the overhead/document camera for 2-3 seconds. Cover the ten frames, and ask the students how many dots were on the ten frames. Students share strategies such as, “I saw 4 ten frames and 8 ones. 10, 20, 30, 40, + 8. So it’s 48.” Another strategy might be “I saw 5 ten frames. One was missing two dots so that’s 8. It’s 48.” Continue “flashing” different ten frame amounts & discussing strategies.
* In first grade students mentally found 10 more or 10 less than a number. Students may need to review this concept before playing this game.
* Cut the ten frame cards and make sets of cards. One set of cards is 10 full ten frames and one each of the 0-9 ten frames. There should be two 5 frames in one set.

**Directions:**

1. Two students work together with one set of ten-frame cards.

2. One student makes a two-digit number with the cards. For example, 45 is built with 4 tens and a 5 ten frame.

3. Both students work to determine what goes with the ten-frame amount (45) to make 100.

4. The students discuss their strategy for determining how far away the number is from 100. Possible strategies used by students: “You made 45.” Student picks up 10 frames and counts up from 45. “55, 65, 75, 85, 95. Now I need to add ones. 96, 97, 98, 99, 100.” That’s 50 and 5 more. So it’s 55. 45 + 55 is 100.
Another strategy: “You built 45. You need 5 more to make 50.” Student picks up the 5 ten frame. “Now I can count to 100.” Student lays out 5 more ten frames. “It’s 55. 45 + 55 = 100.” Students could count up using a 100 board.

5. Each student writes the solution on paper. The solution to the example would be 45 + 55 = 100.

6. Students take turns making the original number.

7. Students record the number sentences.

8. Students can use a calculator to check their number sentence.

9. After students have played the game have a class discussion on the strategies used. The teacher shows 28 using ten frames. Ask the students how to determine how far 28 is from 100. Students share strategies. Have partners explain one of the problems they solved and how they solved the problem. See Questions to Pose (below) for possible questions.

**Questions to Pose:**

Before the game:

* How will the ten frames help you figure out how far away the number is from 100?
* How can you use skip counting by tens to help figure out how far away this number is from 100?

As students play game and during the class discussion:

* What was your strategy to figure out how far away this number was from 100?
* How can you use skip counting by tens to help figure out how far away this number is from 100?
* Look at the one’s place. How far away is that number from 10? Does that help you solve this problem?
* How did the hundreds board help you solve the problems.
* How does knowing your “ten” facts help you with this game?
* After several problems have been solved, ask what do you notice about the ten’s place of the two numbers? (It will usually add to 9, unless both numbers in the one’s place are both zero.)
* Show the mathematics you used and explain your reasoning.

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| Students cannot count by 10s from any number. | Have students use a 100 board to see the pattern in skip counting by tens from any number.  |
| Students do not fluently know the ten facts. | Look at the ten frames that are not full. Discuss what they notice. For example, looking at the 8 ten frame card a student might notice that there are 5 dots on one side and 3 dots on the other side. Therefore 8 + 3 = 10 and 3 + 8 = 10. There are 2 dots missing on the 8 ten frame card so 10-2 = 8. Continue to discuss the other cards to help build fluency on number combinations. |
| Students think that the tens place must have ten tens. They forget to include the ones. | Have the students count the total number of dots by adding the tens and then the ones. Talk about why the total is more than 100. |
| Students have difficulty making a number with the ten frame cards. | Have students discuss what they notice about the ten frame. Lay different frames out and determine the total number of dots. Discuss ways of determining the number of dots without counting all dots individually. |

**Special Notes:**

**Solutions:**

Student papers will vary.

Adapted from: Teaching Student-Centered Mathematics, Grade K-3 by John A. Van de Walle and LouAnn H. Lovin



