PROBLEM SOLVED

MAKING SENSE OF MATHEMATICS

After watching the *Rational Counting* video, make sense of the mathematics by taking a closer look at the problems from the video and the solutions. Use this review of the video to help you develop an understanding of the difficulties children have when learning to count objects and ways to help them develop a deep understanding of counting.

Video Problem: *Nate is helping his niece and her friends make caramel apples. They need to determine if they have enough apples and sticks to make ten caramel apples.*

When Nate first tried to count the apples, he counted very fast and counted some of the apples twice. Children often make similar mistakes. They miss items or count some items more than once. Sometimes they double count the last item because they are counting too fast to keep track of each item. One way to help children avoid making these types of errors is to have them slow down when counting. It also helps to have children move the items as they count them so each item gets counted once and only once. You might help children move the items into a row, like Nate did with the apples in the video.

You might also help children make rows of five. This makes it easier to see groups of ten. Working with groups of ten helps children understand two-digit numbers. Rearranging the apples in the video made it easier to see 12 as 10 and 2 more.

After the children rearranged the apples into two rows of five with two extras, Jack asked Nate, "How many apples are there?" Nate started to count the apples again even though he already counted the 12 apples. Children might recount objects, like Nate recounted the apples in the video, because they do not understand that the last number counted is the

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total number of objects. Likewise, children may not understand that rearranging the objects does not change the number of objects. You can help children by spending time counting objects, rearranging objects, and counting them again. After counting objects, talk about how many objects there are in the set.

After counting the apples in the video, the children check the instructions. Alex states that the recipe on the caramel bag calls for 10 apples and there are 12 apples. Then Nate asks, "Do we have enough apples?" Children who accurately count objects do not always have a complete understanding of the meaning of the numbers. Children may not know that the order of numbers in the counting sequence tells order of magnitude. Ten comes before 12, so 10 is less than 12. After counting objects, discuss whether or not the number of objects in the set is more or less than another number.

The children in the video establish that they have enough apples and focus on the 10 apples arranged in two rows of five. Then they discover that two of the apples are bruised. They do not want to use the bruised apples to make caramel apples, so they decide to remove two. Nate thinks this means that they are not using the second apple. Alex explains that they are removing two of the apples, not the second apple. Children sometimes confuse when a number tells how many and when a number tells order. The following diagrams from the video illustrate the difference between these two ideas.

This diagram does not highlight three apples. It highlights the third apple.

The following diagrams show two different ways to represent three apples.
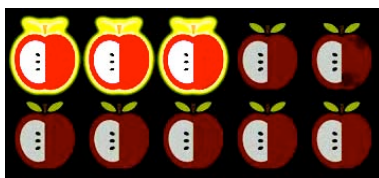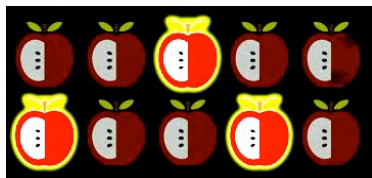
In order to help children understand these number concepts, ask questions to help children understand when a number tells how many and when a number tells order. For example, you might have children put four apples in a basket or the fourth apple in a basket.

In the next scene in the video, the children decide to replace the two bruised apples with the two extra apples. Nate asks, "Do we need to recount the apples?" Abby assures him that they still have 10 apples and do not need to recount them. Children may not understand that replacing one or more objects in a set with the same number of different objects does not change the total number. Once again, give children lots of opportunities to count objects. Also add objects to the set, remove objects from the set, and replace objects with the same number of different objects. Discuss when the total number of objects changes and when it doesn't change.

Finally, the children in the video establish that there are 10 good apples, and they are ready for the sticks. The package says there are 10 sticks, but Nate thinks that when the sticks are bunched together like those shown in the picture on the left, there are not enough and when the sticks are spread out like those in the picture on the right, there are too many.

The number of sticks is the same regardless of whether they are spread out or bunched together. Children might think that spreading objects out means there are more. To help children understand that rearranging objects does not change the number of objects, spend lots of time counting small groups of objects, changing the arrangement of the objects, and counting them again.

At this point in the video, Alex suggests they put one stick in each apple to find out if there are 10 sticks. When they are finished, Nate wants to count the sticks. The children point out that there are 10 apples and there is one stick for each apple, so there are 10 sticks. Children may not understand that if two sets match, they have the same number of objects. Have children count a set of objects and then match them with another set. Then discuss how many objects are in each set. Setting the table is a great time to make sense of this concept. If the number of plates matches the number of glasses, there are the same number of plates and glasses.

Rational counting is more than being able to recite the number names in order. It is applying the number names to a set to determine how many are in the set. It involves multiple number concepts. Children learn to count rationally and understand numbers when they have lots of learning opportunities spread out over time. Spend time counting objects, rearranging objects, replacing objects in the set, matching two sets of objects, and most importantly, talking about the results.