PERFORMANCE TASK: The Bike Shop

Approximately 1-2 Days

STANDARDS FOR MATHEMATICAL CONTENT

MCCK.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings[1], sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.

MCCK.OA.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

MCCK.OA.3 Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).

MCCK.OA.4 For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

MCCK.OA.5 Fluently add and subtract within 5

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.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

In developing the meaning of operations, teachers should ensure that students repeatedly encounter situations in which the same numbers appear in different contexts. For example, the numbers 3, 2, and 5 may appear in problem-solving situations that could be represented by 2 + 3, or 3 + 2, or 5 – 3, or 5 – 2. Although different students may initially use quite different ways of thinking to solve problems, teachers should help students recognize that solving one kind of problem is related to solving another kind. Recognizing the inverse relationship between addition and subtraction can allow students to be flexible in using strategies to solve problems (NCTM Principles and Standards, 2012).

ESSENTIAL QUESTIONS

- What happens when I decompose a quantity?
- How can I use different combinations of numbers to represent the same quantity?
- How can I represent problems using objects, pictures, and numbers?
- Why is it important that I can build the number combinations for the number 5?

MATERIALS

- The Bike Shop Recording sheet
- Bicycle cut-outs (if necessary)

GROUPING

Whole/individual/small group task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I
Begin by discuss bikes and bike shops with students. Allow students to share any experiences they have had with bikes. Specifically, discuss different types of bikes and what makes them different (focus on the wheels in particular). Ask the students the question "if I have 3 wheels sitting at home in my garage, what types of bikes could be in my garage?" Students will immediately say a tricycle but have them mentally explore possible combinations of bikes (unicycle and bike, for example).

Part II
Present students with the following task being sure to go over terms and understanding. Many students will know what a display case is, but not the formal name for it.

> *The Bike Store sold unicycles, bicycles, tricycles and go-carts. The owner of the store could only fit a total of 5 wheels in the display case at the front of the store. What are the different combinations of bikes and go-carts that could be put on display in the front of the store? Explain and justify your mathematical thinking.*

Part III
Begin this part by allowing students to explore the possible combinations of bike wheels for number less than 10. Ask the students "if there were 5 wheels and 3 seats in the front display case, what could be in the display?" Students will struggle more with this concept because of the addition of a specific number of seats. As students work through this task watch for students that have more or less than 3 types of bikes. This would indicate that students don't understand the purpose of the seats and how the number must remain constant. After students have solved this problem present the following task:

The Bike Store sold unicycles, bicycles, tricycles and go-carts. In the front display case they are 10 wheels and 6 seats. What types of bikes are on display in the front of the Bike Shop? Explain and justify your mathematical thinking.

FORMATIVE ASSESSMENT QUESTIONS:

- Are there any more was to decompose the number 5 or 10? How do you know?
- Why did you decide to do it his way?
- Are you sure that you have found them all? Why do you think so? How do you know?
- Did you develop a strategy to find your answers?
- Did you identify any patterns or rules? Explain!
- Are there any paired combinations to 5/10 that you were unable to model? If so, share your thinking.

DIFFERENTIATION

Extension

- Have students create a combination of bike wheels that are equal to 10. Partners play and try to identify the combination used by their partner.

Intervention

- Use clip art of unicycles, bicycles, tricycles, and go carts for students to manipulate and exchange one type of bike for another.
- For Part III (specific combination to 10), have students find any combinations to 10 that are possible and remove the restriction of 6 seats.

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