Grade 4 / Case Study 1

➡ **MATH** ✳ **SMARTER BALANCED PERFORMANCE TASK**

Item 1	According to the supply list, how many paint brushes are needed for 24 students?

Student Response to Item 1	
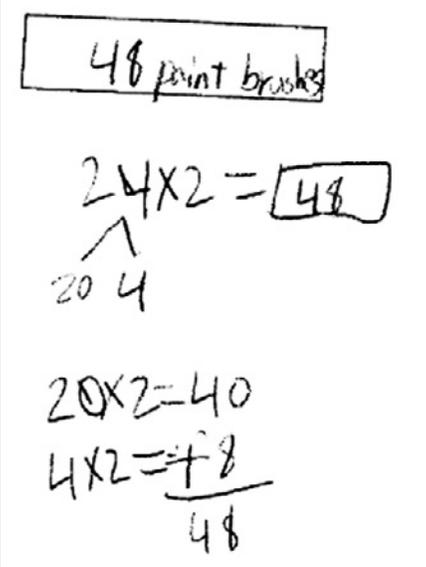
Analysis of Response to Item 1	This response earns a score of 1 out of 1 possible point. The student accurately calculated the total number of brushes needed using the parameters of 2 paint brushes for each student with 24 students needing paint brushes.

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Item 2	According to the supply list, how many pounds of clay are needed for 24 students?

Student Response to Item 2	

120 pounds of clay

$24 \times 5 = 120$

20 4

10 10

$10 \times 5 = 50$ $5 \times 4 = 20$
$10 \times 5 = 50$

50
+50
____
100
+ 20
____
120

Analysis of Response to Item 2	This response earns a score of 0 out of 1 possible point. The student incorrectly indicated that 120 pounds of clay are needed for Art Day. The student used the amount of 5 pounds of clay, instead of the correct amount of 3 pounds of clay per student.

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Item 3	You need 120 pieces of chalk for Art Day. Your teacher has 6 boxes of chalk. Each box has 18 pieces of chalk. Is this enough chalk for Art Day? Explain the steps you used to figure this out.
Student Response to Item 3	
Analysis of Response to Item 3	This response earns a score of 2 out of 2 possible points. The student used decomposition and the distributive property to accurately calculate the number of pieces of chalk necessary for 24 students. In addition, the student compared the amount of chalk available (108 pieces) to the total amount needed (120 pieces) to determine that there was not enough chalk available.
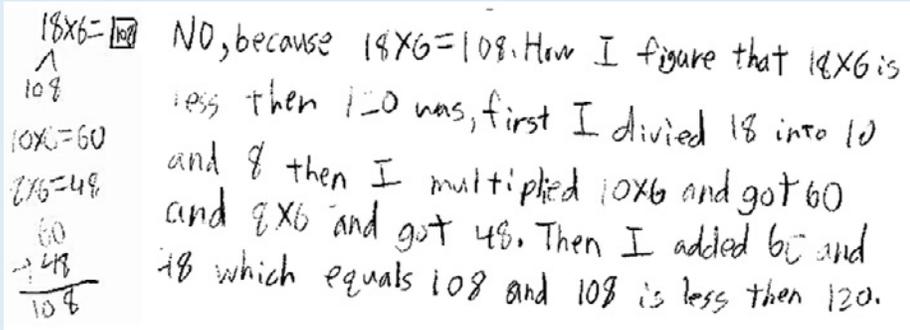
Item 4	Your next task is to help plan the schedule for Art Day using the information from **Task 2: Schedule.** Create a schedule for your class to follow on Art Day. You must follow the order given in the table.
Student Response to Item 4	**Art Day Schedule*** | Activity	Start Time	End Time
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Painting	9:00 a.m.	10:10 a.m
Break	10:10 am	10:30 am
Pottery	10:30 am	11:20 am
Lunch	11:20 am	12:00 pm
Chalk Art	12:00	2:00 p.m.	 *Times must be given using a 12-hour clock.
Analysis of Response to Item 4	This response earns a score of 1 out of 1 possible point. The student met all of the requirements of the item by creating a schedule that correctly applied the provided information. The student allotted 70 minutes for the first activity and 50 minutes for the second, with the time for the final activity being much longer, at 2 hours. The student correctly totaled the break and lunch time to equal exactly one hour (20 minute break and 40 minute lunch). The response contains evidence of the student's ability to retrieve information from the context, and design a model that satisfies the given constraints.

Item 5

When the class went to the Painting Station at 9:00 a.m., the container of paint was completely full. After 6 of the 24 students got their share of paint, the paint level had dropped to the level shown in the following picture.

Paint Level

Paint

At 9:00 a.m. paint container is full.

Paint Level

Paint

After 6 students got their share of paint, the level is here.
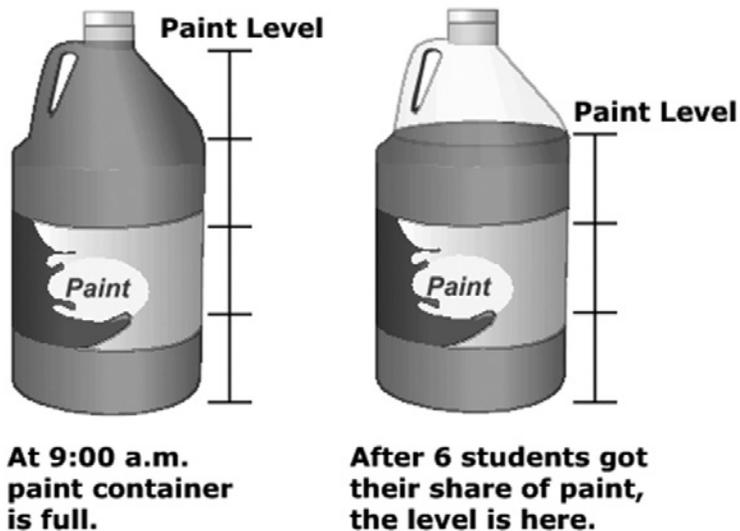
Katie thinks there is not enough paint for the rest of the students.

Do you agree with Katie? Explain why or why not. Use the information shown in your explanation.

Student Response to Item 5

I disagree with Katie because some people will use more paint and some people will use less paint so it depends on students.

Analysis of Response to Item 5

This response earns a score of 0 out of 1 possible point. This item requires interpretation of a diagram as well as interpretation and application of given information to draw a conclusion. Although the student stated that s/he disagreed with Katie, s/he did not explain or support this decision with mathematical reasoning.

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Overview of Student's Performance

The student's responses demonstrate good use and understanding of Standards for Mathematical Practices 1, 2, and 7. Throughout the task, the student used number sense to solve problems and make sense of the numbers used in the various items. In item 1, the student used number decomposition to provide friendlier products, demonstrating the student's strategic thinking about computing with multi-digit numbers. In item 3, the student explained his/her process of solving the problem by giving a step-by-step description of the solution strategy, providing further evidence that s/he has a good handle on the process. Although in item 2 the student used incorrect numbers in an expression, s/he did solve the problem s/he created correctly, showing facility with computation but an issue in attending to precision.

Throughout the task, the student displayed an ability to think and reason about the problems and hold multiple restrictions and components of a problem in his/her thinking while solving the problem. This is evident in items 3 and 4, in which the student showed that s/he could go back and forth between several pieces of information and develop valid responses. However, the student's initial understanding of the task did impact his/her performance, for example, using an incorrect number when computing in item 2, and not knowing to use the side of the container as a tool to think about the situation presented in item 5.

The student would benefit from opportunities to describe how he/she was thinking about a problem or solution and why this thinking is mathematically valid (SMP 3). For example, in item 3, the student didn't explain the reason for the conclusion. Instead, s/he described a process. In item 5, the student did not use the scale on the side of the container as a tool to think about the problem (SMP 5). Activities that engage the student in SMP 6 would help the student attend to precision in item 2, supporting his/her understanding of a problem and use of correct numbers when writing equations.

Next Steps

The student would benefit from some additions to our lesson activities. I think if we worked on providing more opportunities for the student to talk about how s/he is thinking about a problem, the student would be more successful. For example, we could have some conferences during class with questions like, "How did you come up with that answer?" or "What were you thinking as you solved that problem?" These interview questions during classwork would allow the student to communicate about how s/he was solving a problem. In addition, doing Number Talks during classroom lessons would allow all students to hear how other students are thinking about a problem and how they might solve it. This exposure and opportunity to hear various thinking strategies would benefit all students working to develop their abilities to explain their thinking and reasoning.

This student would also benefit from opportunities to grow in Math Practices 4 and 5—modeling with mathematics and the use of tools. This could occur through conversations about different mathematical models, including asking the student what information a model might provide, giving the student real-life experiences with volumes and opportunities to predict what might happen in different situations. Through multiple experiences using measurement, either with a ruler or measuring cup, the student could begin to understand the purpose and usefulness of measurement markings. Early activities could start with having the student pour different amounts of liquid into same-sized containers and communicating what s/he notices about the levels of the liquids, and observing what happens when drinking water out of a bottle or using glue from a glue bottle. These experiences would help the student develop meaning for the measurement markings. Following these activities, the student could discuss how s/he might use the lines to describe what is happening with the material inside the container, which would provide ample opportunities for the student to verbally describe what is happening.

Additional opportunities could be provided to stretch the student's mathematical computation skills. This could be done by providing more challenging problems that use larger multi-digit numbers.