**The Case of Sandra Pascal[[1]](#footnote-1)**

Ms. Pascal began the lesson by showing her students a small candy jar that she had filled with 5 Jawbreakers (JBs) and 13 Jolly Ranchers (JRs). She explained to students that they would be working on a task that required them to make new candy jars that had the same ratio of candy as the initial jar (the one she was holding) but had larger amounts of each candy. Their job, she explained, was to determine the exact number of particular candies in the new jar. She told students that she had placed bags of red and green tiles on their desks that they could use to represent the candies.

A candy jar contains 5 Jolly Ranchers (JRs) and 13 Jawbreakers (JBs). Solve each of the following problems and explain your thinking:

1. Suppose you had a new candy jar with the same ratio of Jolly Ranchers to Jawbreakers as shown in the picture, but it contained 100 Jolly Ranchers. How many Jawbreakers would you have?
2. Suppose you had a candy jar with the same ratio of Jolly Ranchers to Jawbreakers as shown above, but it contained 720 candies. How many of each kind of candy would you have?

Figure 1. The Candy Jar Tasks (Adapted from Smith, M. S., Silver, E. A., Stein, M. K., Boston, M., & Henningsen, M. A. (2005). *Improving instruction in rational numbers and proportionality: Using cases to transform mathematics teaching and learning, Volume 1*. New York: Teachers College Press.)

As students began working with their partners on the first candy jar problem, Ms. Pascal walked around the room stopping at different groups to listen in on their conversations. The first group she visited was happy to see her. They were not sure what to do and pleaded with her—“help us.” She asked the group what the first question was asking them to find. Alexis said that they needed to find the number of JBs in the new jar but they weren’t sure how to do it. Ms. Pascal then asked the group if they could use the red (JBs) and green (JRs) tiles she had provided to help see how the candy jar grew. When even this suggestion seemed to puzzle students, she told them to count out 5 JRs and 13 JBs and then to keep adding 5 red tiles (JRs) and 13 green tiles (JBs) to the pile to see what bigger jars with the same ratio would look like. As she moved on to other groups, she noticed that most groups had amassed a pile of JRs and JBs but were unable to describe what the piles meant other than “bigger jars.” It seemed that students had lost track of the target – the number of JBs they would need in a jar with 100 JRs.

At this point Ms. Pascal decided to call the class together to see if she could give them a bit more direction without having to visit each group individually. Clearly students were not making progress on the task and she did not want them to waste any more time counting tiles. She reminded students of the table they had created the previous day (see Figure 2) in which they had generated ratios equivalent to 5 JRs to 13 JBs and projected it on the SmartBoard. She suggested that they might want to consider extending the table in order to find out how many JBs there would be when you had 100 JRs. She told them that if they were using the colored tiles they could use the table to keep track of how many of each type of candy they had after adding an additional 5 JRs and 13 JBs. In order to make sure that students understood how the table would continue to grow, she asked the class how many JRs and JBs there would be in the next biggest jar. While several students looked confused by the question, a few hands shot up. Ms. Pascal called on Alicia who tentatively said “25 and 65?” Ms. Pascal asked if anyone agreed with Alicia. Dominic said, “Yeap. She is right. You just add 20 + 5 and 52 + 13.” She then told students to continue working on the problem.

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| --- | --- | --- | --- | --- |
| **JR** | 5 | 10 | 15 | 20 |
| **JB** | 13 | 26 | 39 | 52 |

Figure 2. The table of equivalent ratios generated by the class the previous day

Students returned to their partner work with renewed energy. As Ms. Pascal continued to monitor their progress, she noted that students were easily able to extend the table and arrive at the correct answer. When she asked the groups how many JBs would be in a bag that had 100 JRs, they were able to look at the table and tell her 260 JBs. When she asked one group why it was 260 they responded, “We kept adding 5 JBs and 13 JRs until we ended up with 100 JBs. Then we knew we had the right number of JR.”

After about 10 minutes she brought the class together. She asked Ellen and Chuck to share their table with the class. Ellen and Chuck proceeded to explain that they had continued the table by adding 5 JRs to the first row and 13 JBs to the second row until they got to 100 JRs and 260 JBs (see Figure 3). Ms. Pascal asked the class how many had a similar table. Nearly every hand in the class went up. Ms. Pascal thanked the group for their work and reminded the class that tables could be really helpful in solving all types of problems.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **JR** | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
| **JB** | 13 | 26 | 39 | 52 | 65 | 78 | 91 | 104 | 117 | 130 | 143 | 156 | 169 | 182 | 195 | 208 | 221 | 234 | 247 | 260 |

Figure 3. Ellen and Chuck’s completed table.

Ms. Pascal then told the class that they could now begin work on part b of the task. She gave them a few minutes to get started before she began checking in with the groups. What she noticed was that the groups were extending the table by continuing to add 5 and 13. When she asked a group why they were doing this, they responded, “we are going to keep going until one of the numbers is 720.” Knowing that this was not going to be productive Ms. Pascal asked, “What are we looking for in this problem? Is it the same as the last problem? What does the 720 represent?” With these questions she hoped students would see that 720 was the total number of candies and that they should add another row to their table that would represent the total.

At that point she notice that she had two minutes before the bell would ring. She told students that for homework she wanted them to take the table they had created for part a and make another row that would be the total, add the number of candies together to get the total number of candies in the jar, and then consider how this could help them answer part b of the problem. She hoped that students would realize that they first had to find the jar that had 720 candies in it and then they would know how many of each type they had.

1. This case was written by Margaret Smith at the University of Pittsburgh, based on patterns of instruction documented in the research literature and observed in dozens of classrooms. [↑](#footnote-ref-1)