Stacking Caps

A peddler carries 9 caps in a stack on his head. The caps are red, tan and checked. Each cap costs 6 cents. The peddler is neat and likes to stack the colors that are alike together. What are the ways he can stack his caps? How much money will he make if he sells his 9 caps?

Grade Levels Pre-K-2

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Context

We have been using the big book, *Caps for Sale* by Esphyr Slobodkina to integrate several mathematical concepts in our multi-age first and second grade classroom. Students have used their own winter hats to organize and sort in a variety of ways. This story lends itself well to organizing information.

What This Task Accomplishes

This task assesses how well students are using their observation skills and skills in patterning, counting, probability and organizing information. It is also a way to reinforce the introduction of money skills.

What the Student Will Do

In solving this problem the students will utilize their previous experiences from sorting, stacking and organizing their own hats to how the peddler stacked his own caps. The students were encouraged to choose from a variety of manipulatives such as Unifix cubes, or linker cubes to illustrate the stacking combinations. First, they were asked to decide on how many of the three colors provided they would use, and show that on their recording sheet. Second, the students were encouraged to show as many combinations as they could that were different, but must keep the colors that were alike together. The students were asked to label each cap in some way to represent the colors so they would show up when copied. The last step involved devising a strategy to find out how much money the peddler would make if he sold all nine caps for six cents.

Time Required for Task

60 minutes

Interdisciplinary Links

The children enjoyed using drama to act out the story, *Caps For Sale*. They used their own hats or the nine caps I brought in to practice being the peddler and monkeys that imitated the peddler's every move.

The students were given a very large outline of a cap and a variety of art materials to design an unusual cap. The class was asked to organize the finished caps in a variety of ways or stacks. They were also asked to decide on a price for their cap (up to 50 cents) so the students could practice buying and selling their work using real coins.

The students were encouraged to write a story about an adventure their cap might have anywhere in the world.

Teaching Tips

Have students practice a variety of patterning, sorting and organizing with their own hats. Bring in caps to stack like the ones used in the story. Use Unifix or linker cubes to keep track of the caps in the story, and practice stacking them in different ways. Children had practiced stacking different colors of caps in their morning "thinker" journal that is kept to develop different strategies for problem solving. Special needs children worked more with manipulatives and conferenced with a peer or adult. Higher-level students can be provided with a harder task to solve or be asked to provide an extension. For the money component to be successful, it is important for the students to have practiced making change with real coins. They also need practice in representing the money with cubes, tally marks, cent signs or other representations.

Suggested Materials

- Unifix cubes
- Linker cubes
- Rainbow tiles
- Children's hats (use real caps if possible)
- Crayons
- Grid paper*
- Bar graph**
- Sheet of 16 or more plain caps
- Large cap outline
- Art materials
- Real coins (pennies, nickels, dimes and quarters)
- Paper
- Pencil to record solutions

* Grid paper was provided with a sheet of caps for the children to practice patterning two, three and four color patterns using colors of their choice.

** A bar graph was provided with a sheet of 16 caps and the directions to color red, blue, brown and yellow caps. The students decided the number to color for each cap and glued them onto the bar graph. Comparisons were made in cooperative groups.

Possible Solutions

The problem has been left open for the students to choose their own number for the colors, but the total must equal nine every time. The colors that are alike must be stacked together. The possible combinations are six and they may use a variety of strategies to label their stacks of caps. The money that the peddler will make if he sells all nine caps is 54 cents.

Benchmark Descriptors

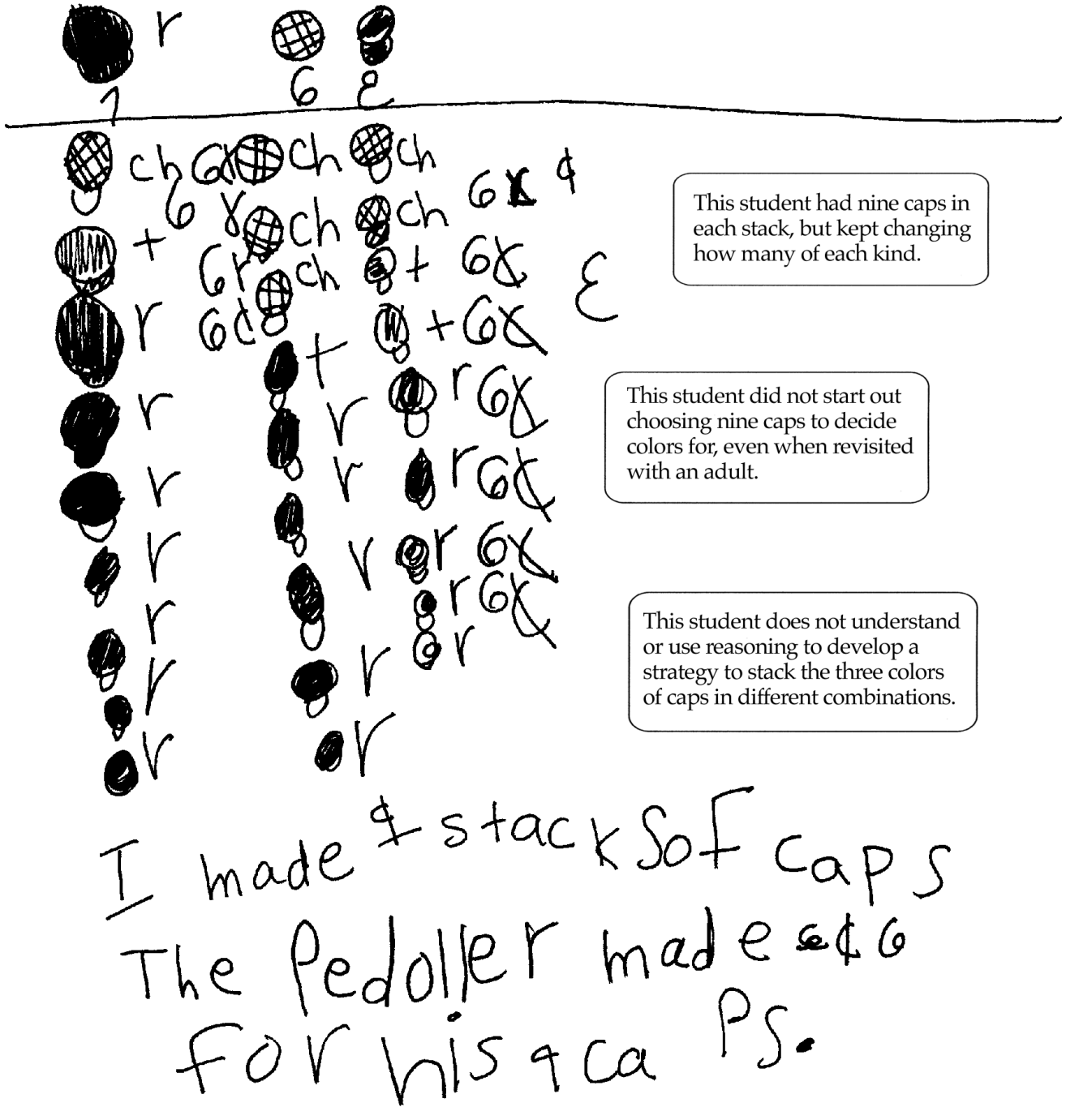
Novice
This student started a strategy that did not solve the problem. The student confused the number of caps with the stacks, which created errors in the mathematical representation. There also is an inappropriate use of notation and limited understanding of the sale of the caps.

Apprentice
This student used a strategy that was useful, but did not come to a full solution. There is evidence of mathematical reasoning and some use of appropriate mathematical notation. The mathematical representation for the money was not accurate.

Practitioner
This student demonstrates a broader understanding of the task and uses strategies that lead to both of the solutions. There is a clear explanation and use of accurate mathematical notations.

Expert
This student effectively demonstrates and uses strategies that provide accurate solutions for the number of stacking combinations and the amount of money the peddler would make. This student also has a more accurate representation of using tally marks grouped by fives.

Novice

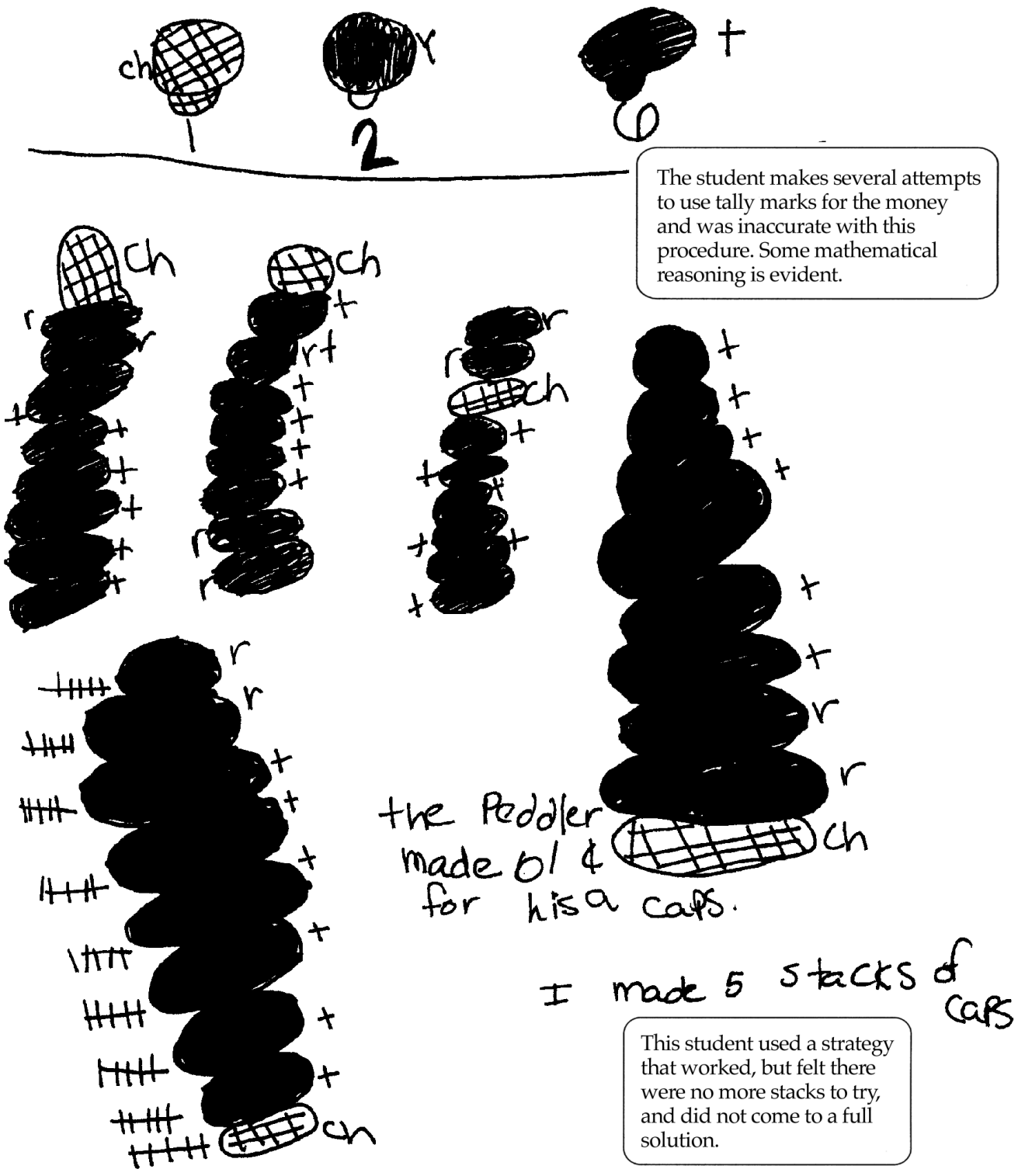


This student had nine caps in each stack, but kept changing how many of each kind.

This student did not start out choosing nine caps to decide colors for, even when revisited with an adult.

This student does not understand or use reasoning to develop a strategy to stack the three colors of caps in different combinations.

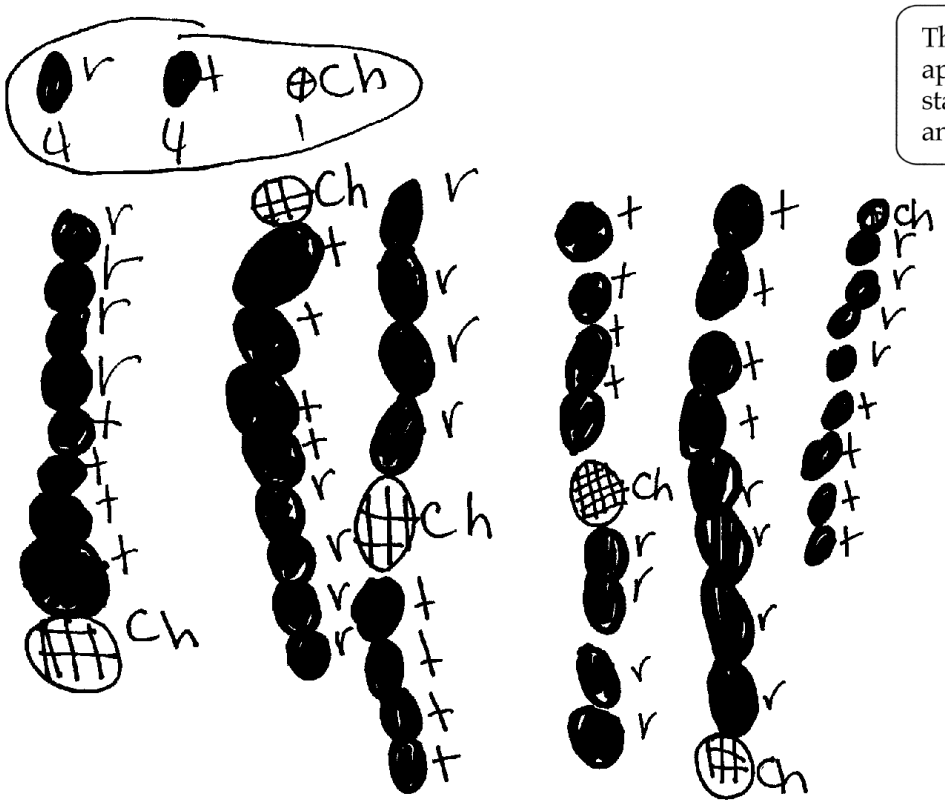
Apprentice



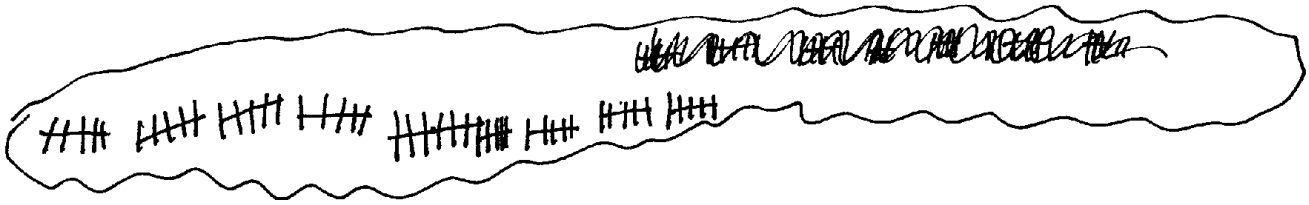
The student makes several attempts to use tally marks for the money and was inaccurate with this procedure. Some mathematical reasoning is evident.

This student used a strategy that worked, but felt there were no more stacks to try, and did not come to a full solution.

Practitioner



This student demonstrates appropriate notation for the stacks of caps of tan, red and checked.

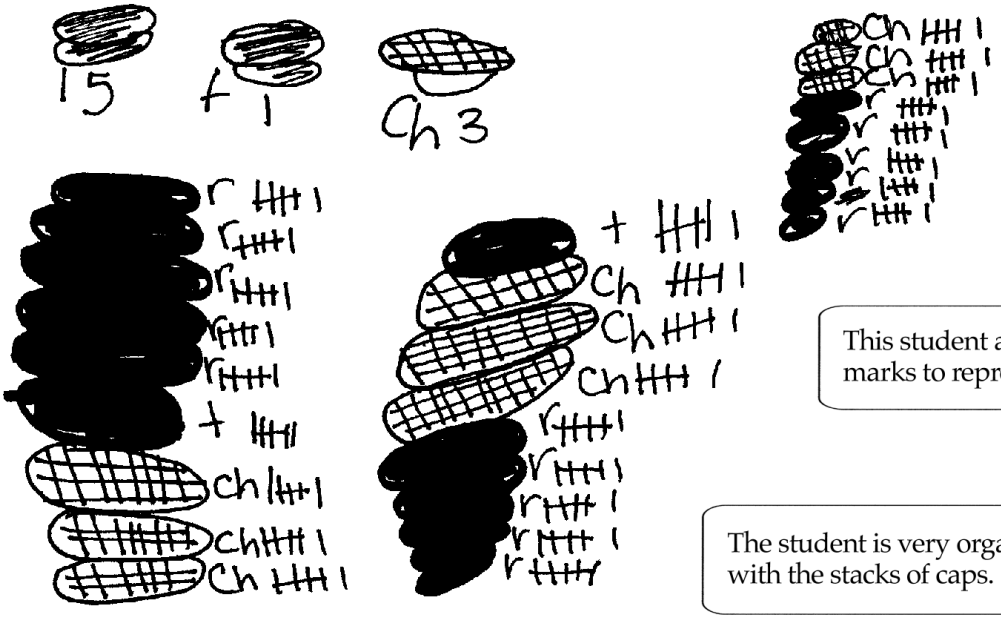


This student changed the tally marks after checking the task information.

I made 6 stacks of caps.

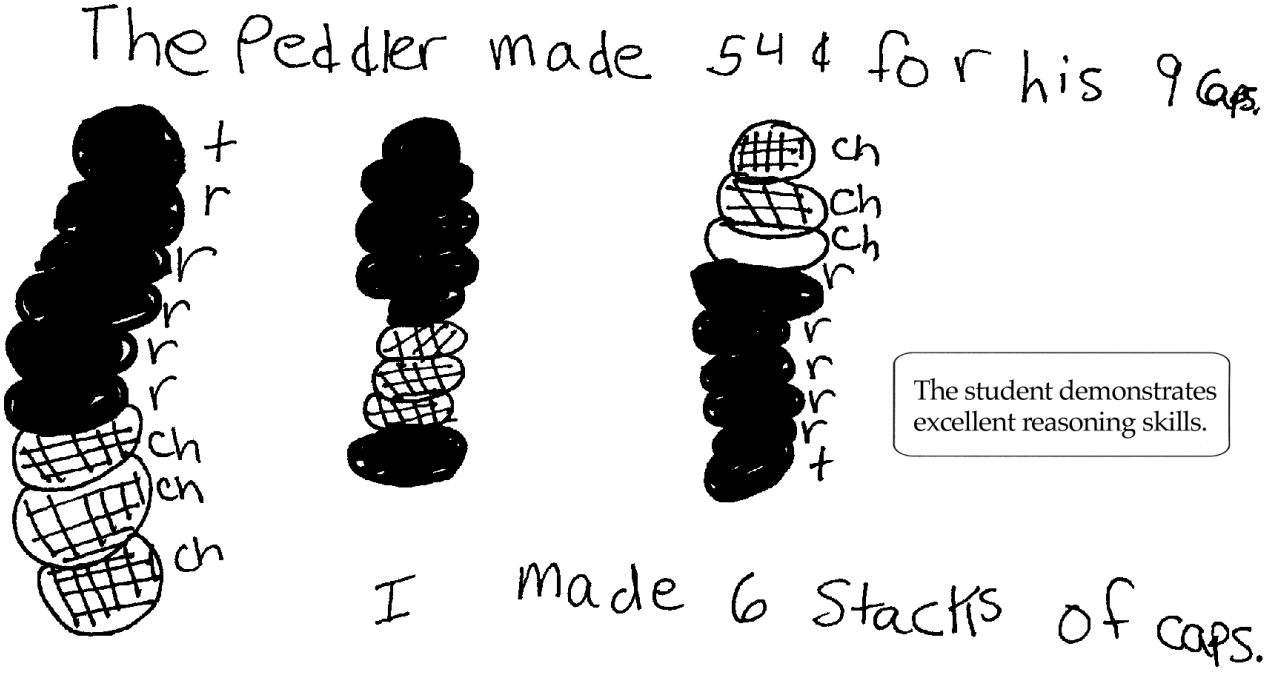
The peddler made 54¢

Expert



This student accurately uses tally marks to represent the money.

The student is very organized with the stacks of caps.



The student demonstrates excellent reasoning skills.