Dominos

Did you know that the white dots on dominos are called pips? Miss Amico's crazy Italian grandparents have a set of dominos with 0 - 9 pips on them. The dominos we have in our classroom have 0 - 6 pips on them and 28 come in a set. How many dominos come in a set with 0 - 9 pips on them?

Grade Levels 3 - 5

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Context

We taught students in this multiage grade fourth - fifth classroom several domino games, as well as read aloud the book *The Math Curse* by Jon Scieszka and Lane Smith, which speaks about how life can be seen as a math problem. Recently, I had been playing dominos with a relative and we were not sure if we were playing with a complete set of dominos. We had to figure out this dilemma in order to be sure our game was fair. I explained this to students and how real life is filled with problem-solving situations.

What This Task Accomplishes

This task is accessible to students in a variety of ways since many strategies can be used to solve the task. The task affords many students the opportunity to use an efficient or sophisticated approach if patterns and relationships are discovered and are used as strategies.

What the Student Will Do

Most students will begin by randomly listing possible domino configurations and then will start over generating the same data in a more organized manner. Most students begin to see a pattern and use that pattern to solve the task. Mathematical representations are created to represent the task visually and assist students in drawing a conclusion.

Time Required for Task

2 hours

Interdisciplinary Links

This task fits in well with a unit on games. As mentioned earlier, students were taught different domino games, constructed domino chains and explored other problem solving tasks involving dominos.

Teaching Tips

It is important for students to have the opportunity to have some time to play with dominos and become familiar with their appearance before starting this task. We played domino games as a class, creating dominos which could be played on the overhead projector for all to see. Many domino games reinforce math facts and number sense, as well as allow students to practice reasoning and logic skills.

Suggested Materials

- Dominos
- Calculators
- Graph paper

Possible Solutions

There are 55 dominos in a set with 0 - 9 pips.

Benchmark Descriptors

Novice
This student misunderstands the task, reaching an incorrect mathematical conclusion. It is unclear what the student is attempting to do to solve the task and the task shows no mathematical reasoning. The student seems to attempt to deal with dominos having pips 0 - 6, but does not address dominos with pips 0 - 9.

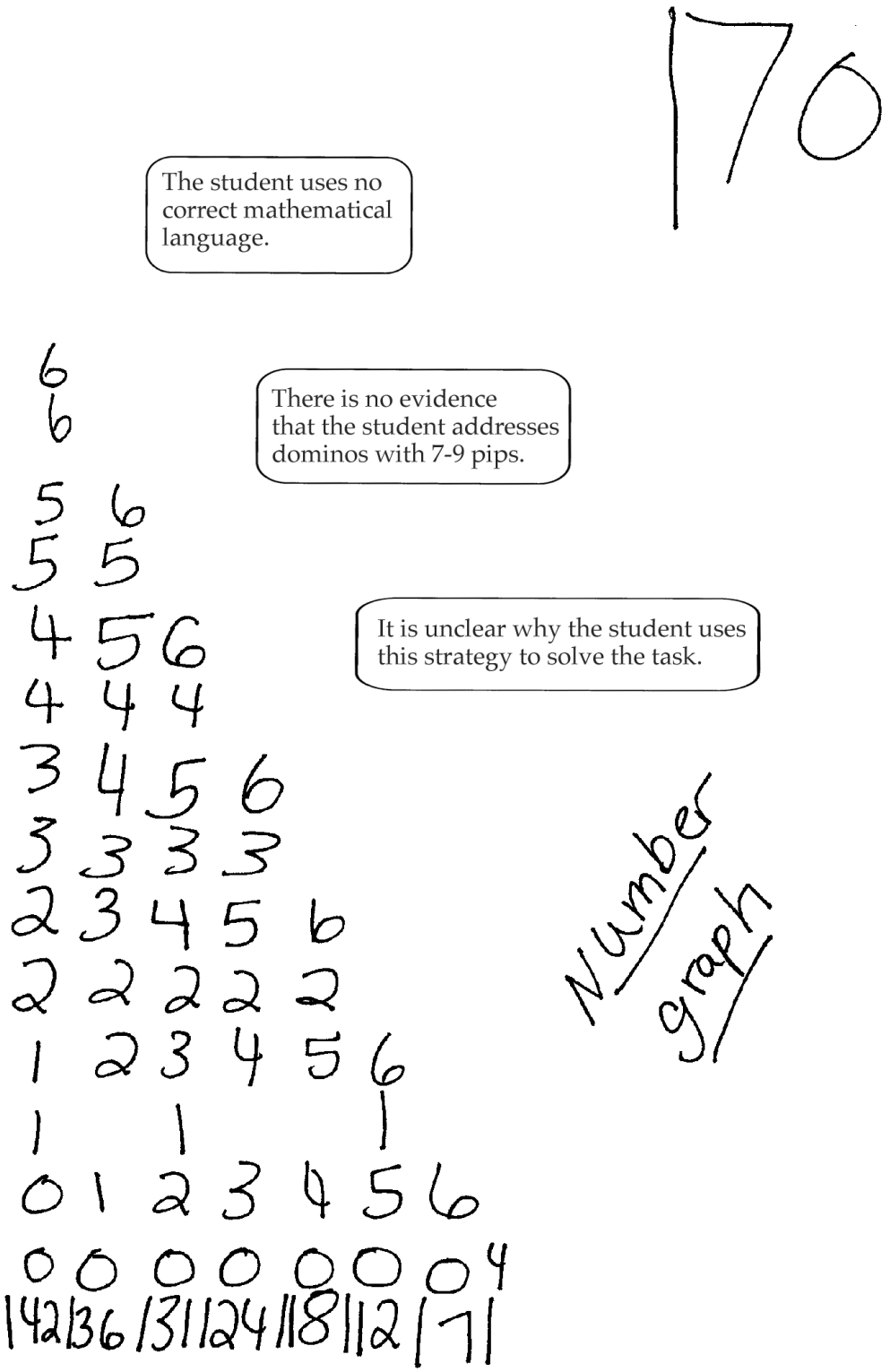
Apprentice
This student has a correct answer, but does not clearly explain his/her reasoning and some of his/her reasoning is incorrect (ex: I found that you start with zero and instead of ending with nine you end with 10 because it has a zero in it.). It is unclear whether or not the student truly understands the task. The student does include a sum of 45 on his/her representation page and 55 as well. The student does not communicate this discrepancy and come to a resolution about it.

Practitioner
This student uses a systematic approach to solving the task by finding a pattern of how the dominos increase each time you add a pip to the game. The student gives evidence of his/her thought process and creates a representation to express his/her solution. This student could be encouraged to look more closely at his/her results to see if s/he can notice any patterns, relationships or generalizations and probably could do so given the organization s/he used in his/her approach.

Expert
Besides demonstrating a true sense of voice in his/her writing, this student solves the task in a very novel way. The student uses a visual observation to create a strategy for solving the task. When concretely organizing the dominos with 0 - 6 pips, s/he notices the shape of the data and uses that shape to try a series of trial and error approaches to discover a formula for solving the

task. Although the student does not communicate this approach as clearly as we may have liked, his/her approach was truly sophisticated for a fifth grader. Once the student made oral comments about the shape of the data, we prompted him/her to use that information to reach a solution. Although the student comments, "Mrs. Amico hinted that since it was half of a square I should divide by two," in reality, after asking the student how s/he would find the area for the right triangle, s/he made the determination that s/he needed to divide by two. The student uses sophisticated math language to communicate his/her solution and verifies his/her formula by substituting other numbers.

Novice



Dominos

Apprentice

Miss Amico,

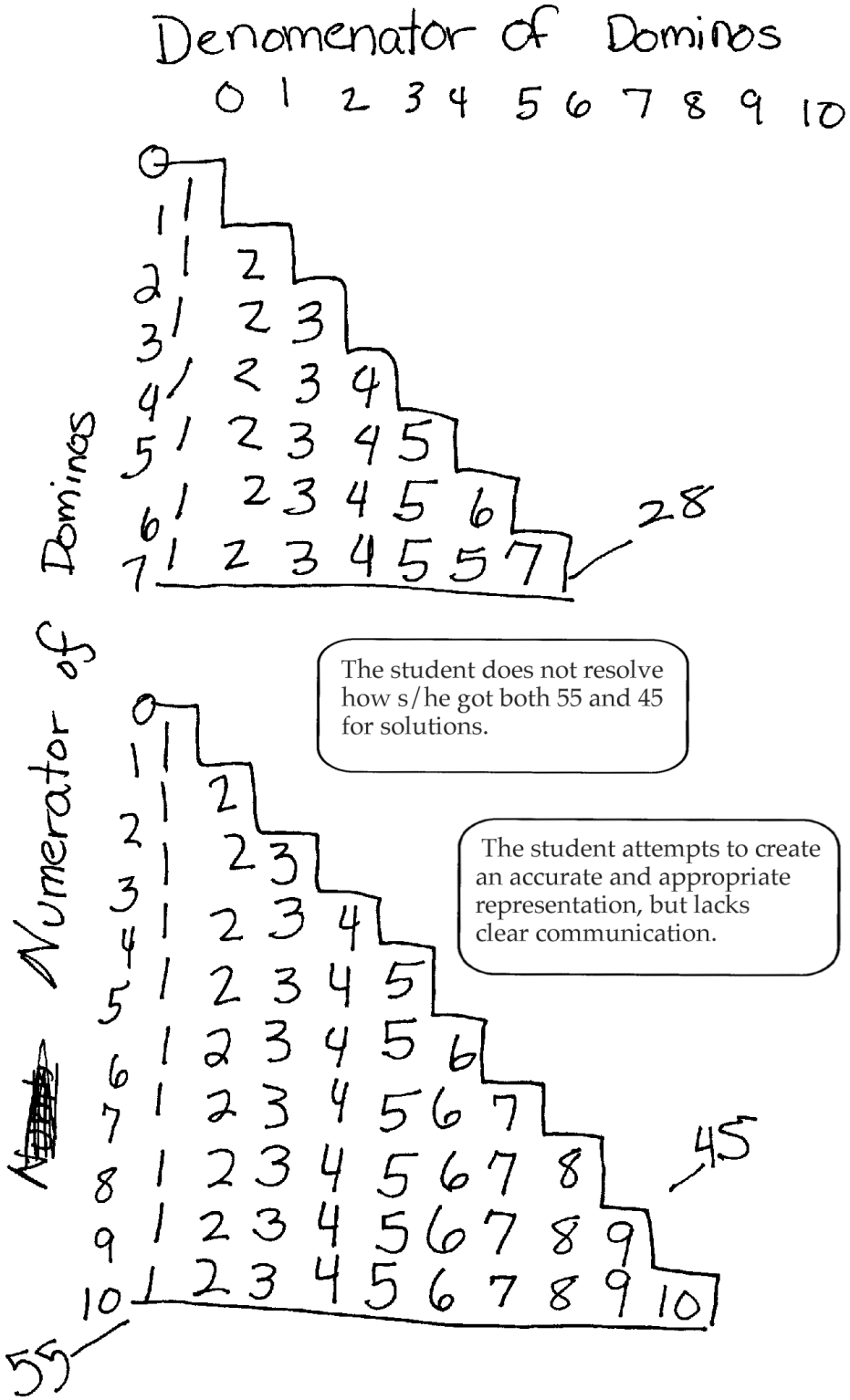
This math problem asked me to find how many dominoes in a pack with 0-9 as numbers. I found that you start with zero and instead of ending with 9 you end with 10 because it has a zero in it. I made a tower on graph paper to show my work. I counted the number of dominoes and came up with 55. I checked again and still came up with 55. I think this is really great math problem.

This part is unclear. Student attempts to verify her/his solution.

PS. Could you make more

Dominos

Apprentice



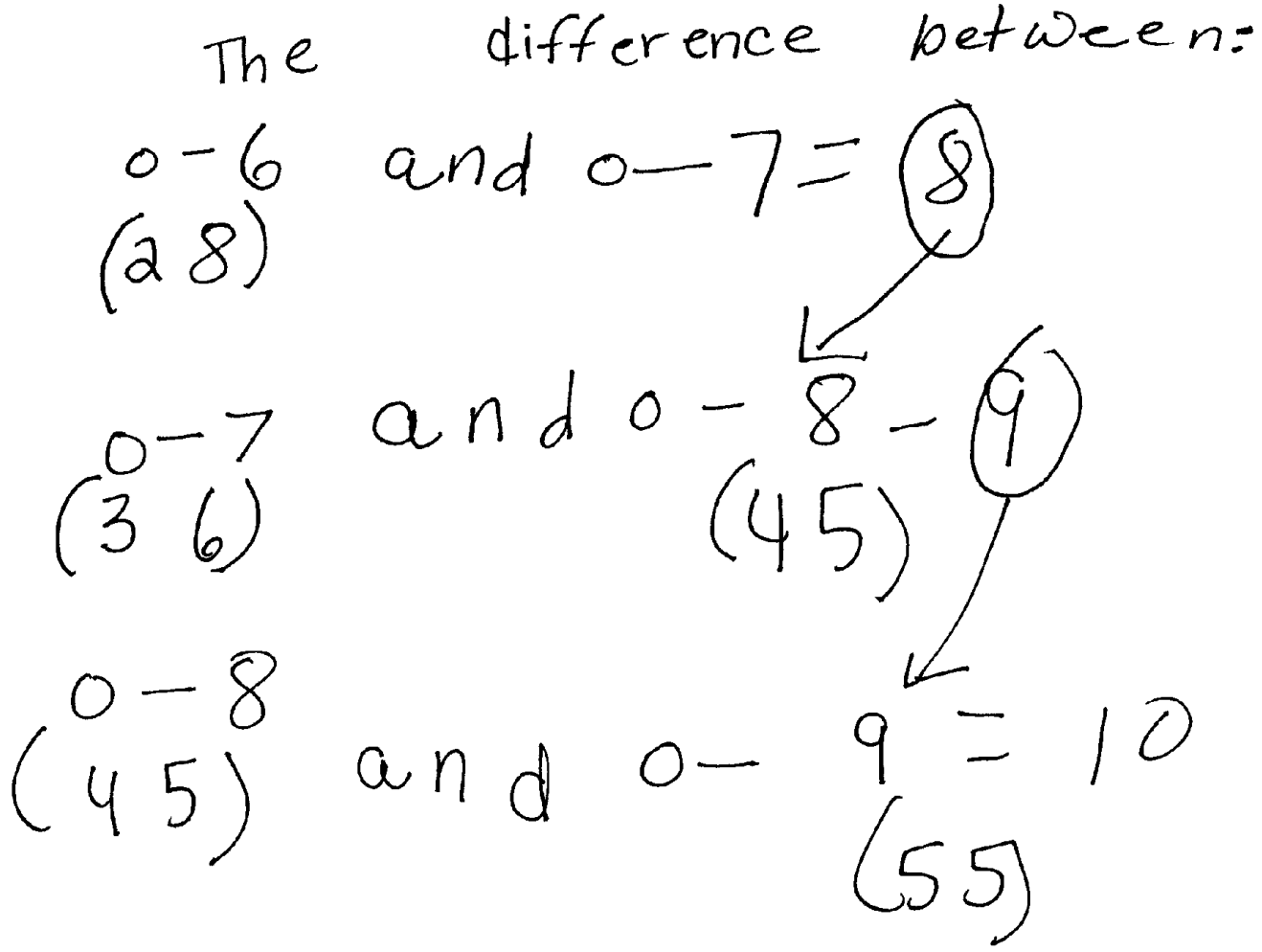
Dominos

Practitioner

I sulved the problem by making a graph of: 0-6, 0-7, 0-8, 0-9. the difference between 0-6 and 0-7 is 8, 0-7 and 0-8 is 9, and 0-9 is 10. the answer for the number of dominoes in a box with 0-9 is 55 dominoes.

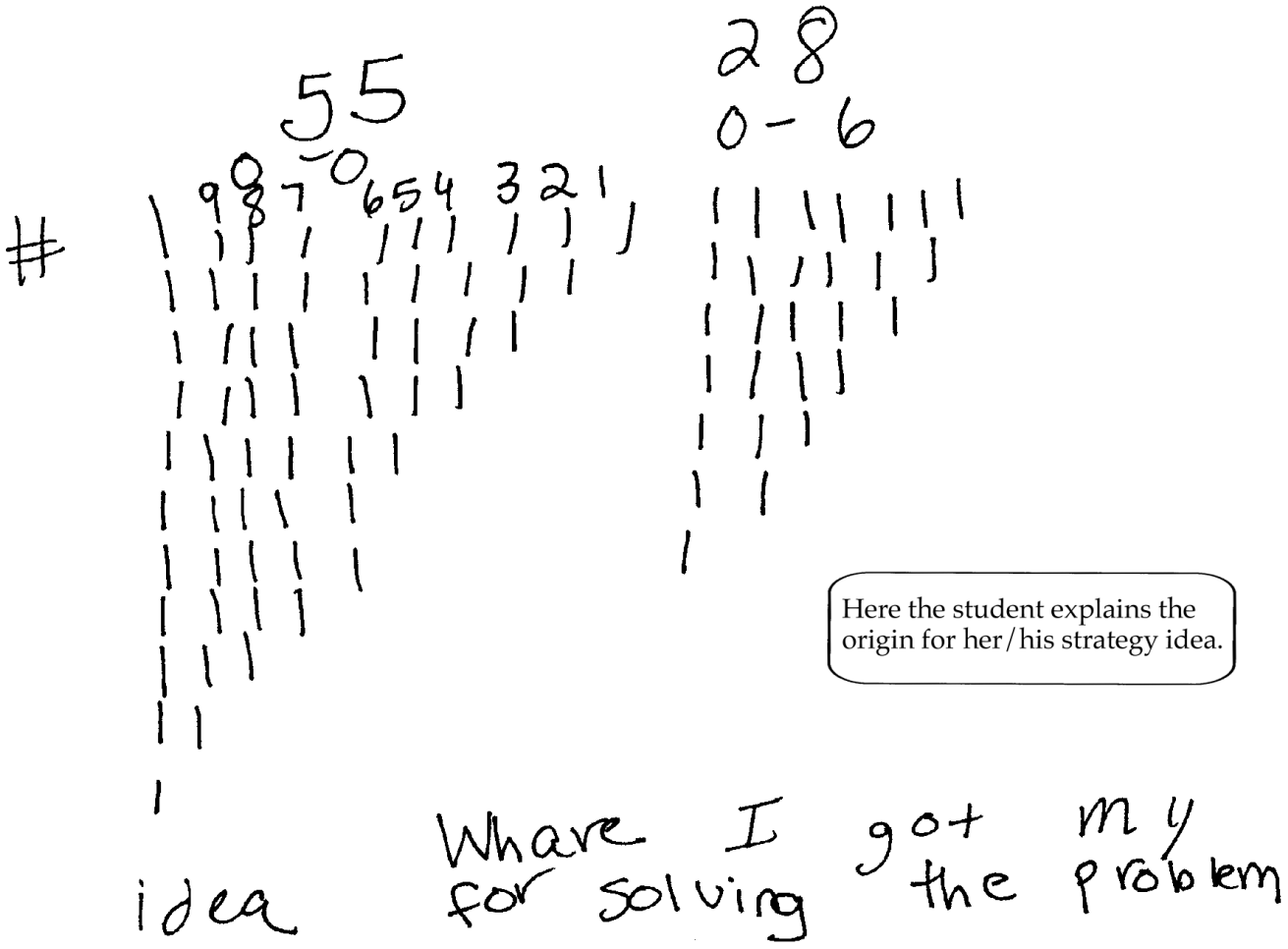
The student observes a pattern and is on the verge of clearly explaining his reasoning, but some gaps are present.

Practitioner

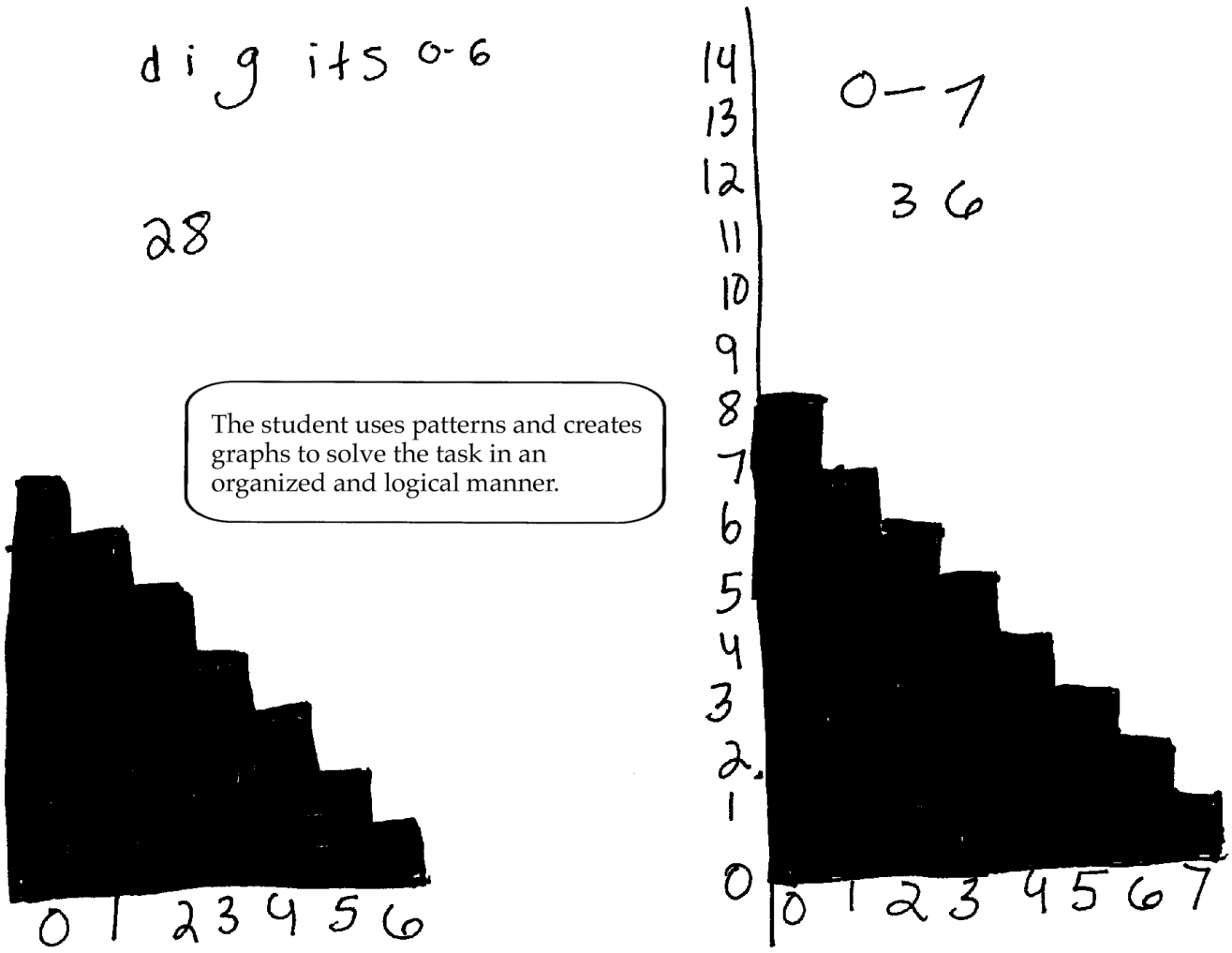


Dominos

Practitioner



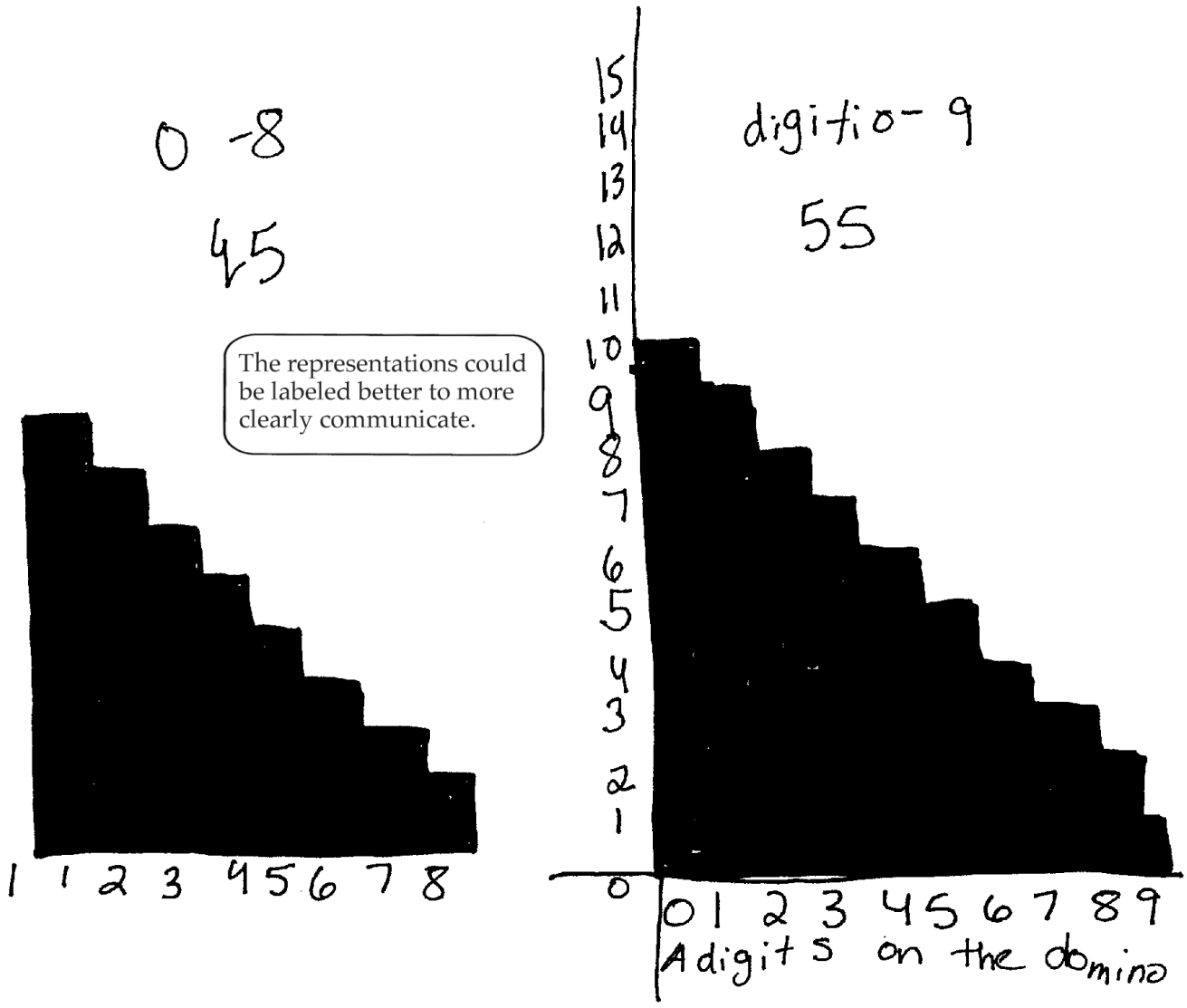
Practitioner



The student uses patterns and creates graphs to solve the task in an organized and logical manner.

Dominos

Practitioner



The representations could be labeled better to more clearly communicate.

Expert

Domino Dilemma Problem #3

Mrs. Amico, formerly known as Mrs. Hassan came into our class and gave my class a choice of 5 or 6 domino-involving math problems, of which two needed to be handed in. I chose number 3 for my first problem. Problem #3 was (in brief) 'Mrs. Amico's relatives taught her to play with dominoes that had 9 pips, which are the dots on dominoes instead of 6 on some of them. How many pips would be on the set of dominoes that Mrs. Amico learned with?'

This student demonstrates a command of math language, which s/he utilizes throughout the piece.

To solve this problem, I got out a domino set and arranged them in order of 0 pips on top of 0 pips on bottom to 6 pips on the bottom of the domino. Even though the pips on the set Mrs. Amico used went up to 9 pips over 9, I did learn something. The arranged domino tiles formed a 90' triangle. His gave me an idea. I wrote down the arrangement on a sheet of paper and found it easy to write it up to 9 pips. I then counted the number of fraction-resembling number pairs on the paper. The sum was 55. Which was the answer to the problem too (obviously).

After solving the problem I was strongly urged by Mrs. McKegney and Mrs. Amico to find a formula for the problem. With some help from Mrs. Amico and stumped look from Mrs. McKegney I started to work on finding the formula. I noticed that the arrangement of assembled dominoes on the sheet of paper, probably because it was a right angle, was exactly half of a perfect square and had equivalent axis. Because this was so, Mrs. Amico hinted that since it was half of a square that I should divide the (x times y axis) by two. That was very close to a part of my formula. It turned out that for some reason I have not figured out yet, (perhaps because of its null value) I should not count the 0/0 at the bottom right of the arrangement on my paper. So now I multiplied the x times the y axis, divided by two and subtracted by 1. This proved to bring better results which were closer to the actual answer. After about half an hour of experimenting, I tried multiplying the x by the y axis, subtracting 1 and then adding the y axis to the equation. This worked. To make sure that my formula was foolhardy, I tried it on many other arrangements. It worked on every one.

From doing this I found the formula for doing problems such as these to be:

$$\underline{XY} - 1 + X$$

The student generalizes his/her knowledge of the mathematical situation to arrive at a formula.

It would have been helpful if the student kept evidence of his/her work so we could see more clearly his/her approach