Seats and Tables

You are in charge of setting up a classroom with 20 places for people to sit. You can use any number of tables and any combination of 3 kinds of tables. A hexagon-shaped table has 6 places. A rhombus-shaped table has 4 places. A square-shaped table has 4 places. How would you set up your tables so that 20 people have a place to sit?

Show how many people can sit at each of the tables and how you know there are places for 20 people. You may use pattern blocks. Pretend the paper is a miniature room. You need exactly 20 places.

Grade Levels Pre-K-2

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Context

We have four different kinds of tables in our room (rectangle, hexagon, circle and small rectangle private office). During lunch and work time, there are specific numbers of people allowed at each table. This creates social strains and naturally gets kids talking about the classroom set up on a daily basis. They initiate their own discussions of how to maximize their contact with people or minimize it with others. I decided to introduce this problem because it is a familiar topic for them and they seem interested in solving our own classroom seating issues.

What This Task Accomplishes

This task pushes students to see multiple solutions. It makes them aware that in this kind of a problem, rearranging the numbers or shapes does not create a different equation or solution. The use of the shapes makes it very concrete and visual for them.

What the Student Will Do

The students will trace shapes and count sides as they go. They will use trials to see which shape will bring them to 20 and choose a bunch of one shape and count sides. If it is too high they will take off pieces until they have 20 sides on their page and then they trace. Students will trace a random number of shapes and put loosely related numbers in each shape including 20. They will use the shapes of tables in the classroom to solve the problem. They will trace and count as they go and then add a different shape (triangle for instance) to collect the last couple. They will place two, three, four, five or six at a hexagon table and two or three at square tables until there are 20 dots at places. They will place checks or dots at each angle instead of the sides which work. They will add in head (two squares are eight) and then add up the squares and hexagons (8 + 12 = 20). They will multiply with tables which hold the same amount of people (5 x 4 = 20) and use equations and counting to add them up. They will try to use all the shapes and erase when the numbers do not count up to 20. They will trace shapes that are a correct solution and not be able to write an equation or the numbers.

Time Required for Task

15 - 30 minutes

Interdisciplinary Links

Social Skills/Cooperative Learning - relating to not being able to control who is in your group or at your table.

Art - planning and designing rooms or buildings.

Teaching Tips

Remind the students that they need exactly 20 places. Remind them that they can use any number or combination of tables to reach 20. When doing the solution as a class, put each solution up in a rectangle (like their paper) and place the tables randomly so they do not rearrange the pieces to make a different equation out of the same section. I put them in a line on the chart paper and they were exercising their understanding of complementary equations (4 + 4 + 6 + 6 = 20 is the same as 6 + 6 + 4 + 4 = 20 in this problem if the fours are all the same shape).

Suggested Materials

- Pattern blocks
- Paper
- Pencils

Possible Solutions

h = hexagon r = rhombus s = square

hhrr
hhss
hhsr
rrrrr
rrrrs
rrrss
rrsss
rssss
sssss

Benchmark Descriptors

Novice

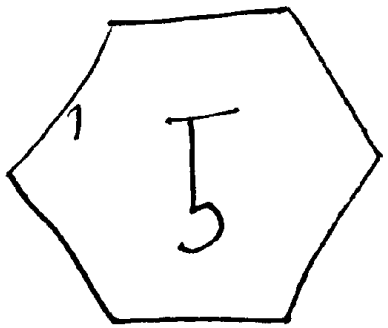
This student did not find a solution. S/he does not know his/her numbers unless s/he counts in order with manipulatives. S/he miscounted the sides of a hexagon and lost track as s/he got into the teens. S/he started counting each table as one seat and then just put a 20 on the last one. The inappropriate concepts were applied and inappropriate procedures used. There are so many errors in mathematical procedure that it could not be solved. The explanation cannot be understood and is unrelated to the problem.

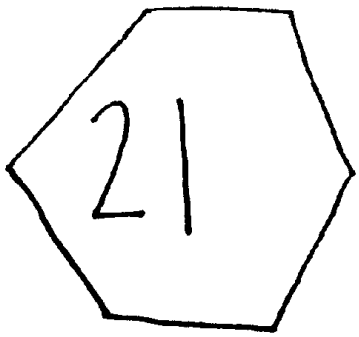
Apprentice
This student was on the path to a solution, but changed the rules when s/he realized hexagons would not have 20 seats exactly so s/he threw in a triangle even though there was no mention of this shape being available. His/her strategy was partially useful. There is some evidence of mathematical reasoning. S/he could not completely carry out the mathematical procedure.

Practitioner
This student's solution reflects effective mathematical reasoning. Addition was used appropriately and successfully. The explanation is clear and accurate. S/he added a second table to a hexagon and counted up to 10 and then repeated. S/he mixed up the terms but his/her diagram indicated that s/he understood what s/he was describing.

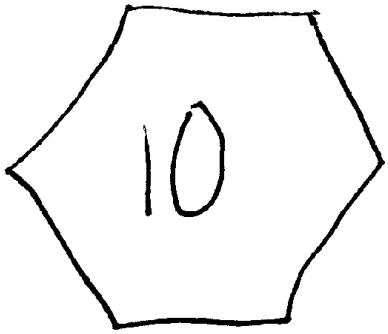
Expert
This student showed his/her deep understanding of the problem by finding two solutions in two different ways. S/he counted as s/he went along and adjusted when necessary on the first solution. S/he used multiplication ("five groups of four" and "5 x 4 = 20") for the second problem. Both strategies are efficient and sophisticated. S/he applies procedures accurately to correctly solve the problem and verify the results. His/her explanation of his/her decisions is clear. The mathematical terminology and notation used to explain the problem is precise and appropriate.

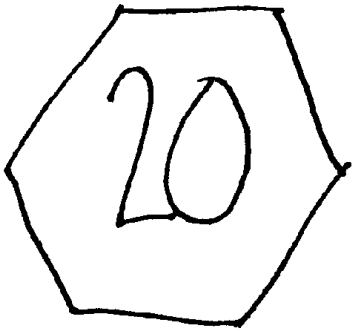
Novice



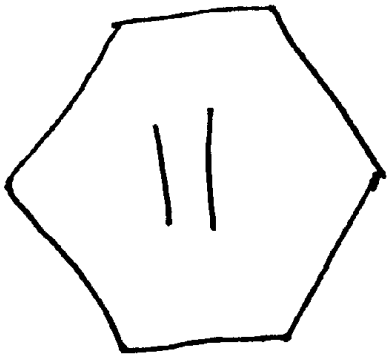


No part of the solution is correct.



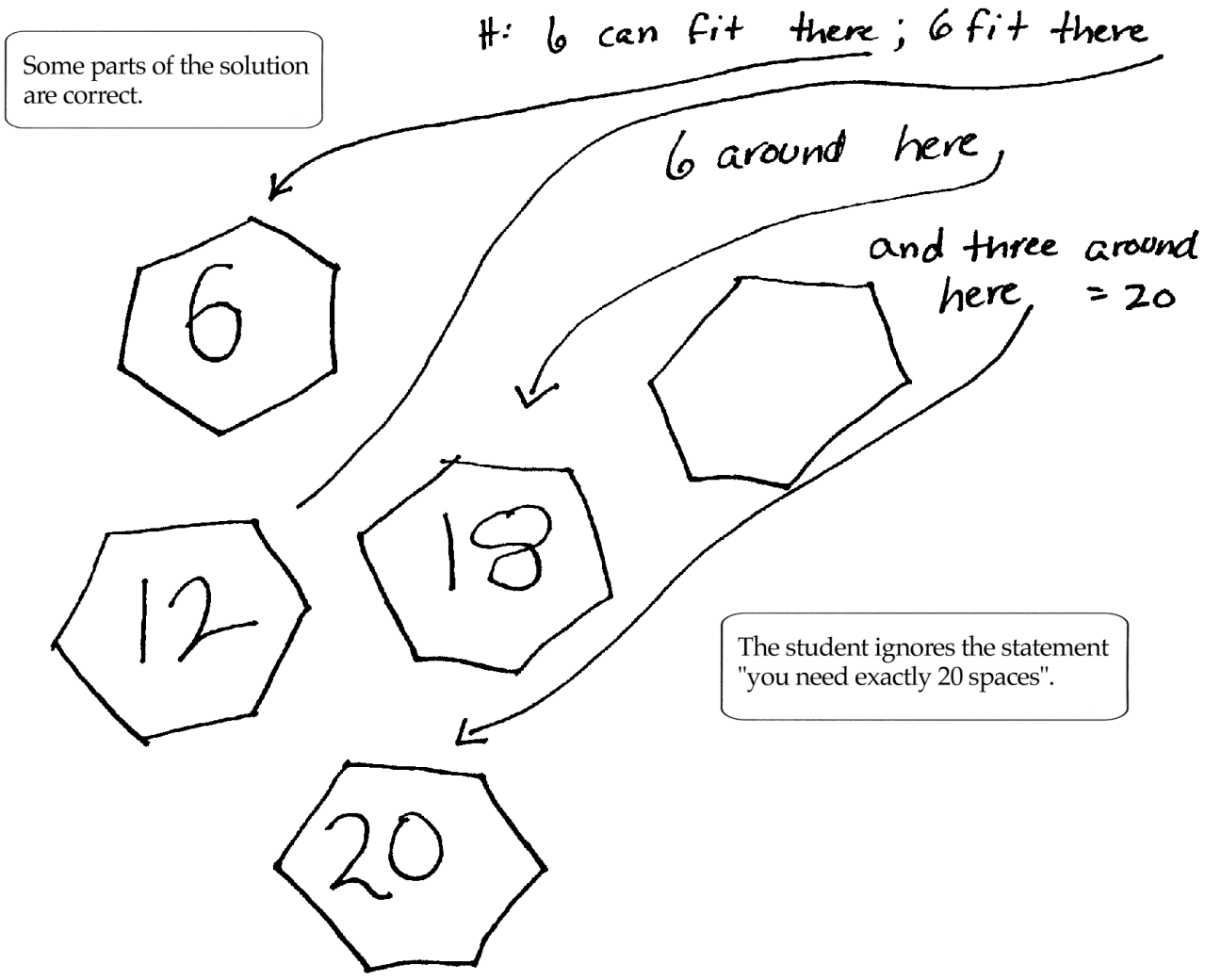


This solution lacks reasoning.

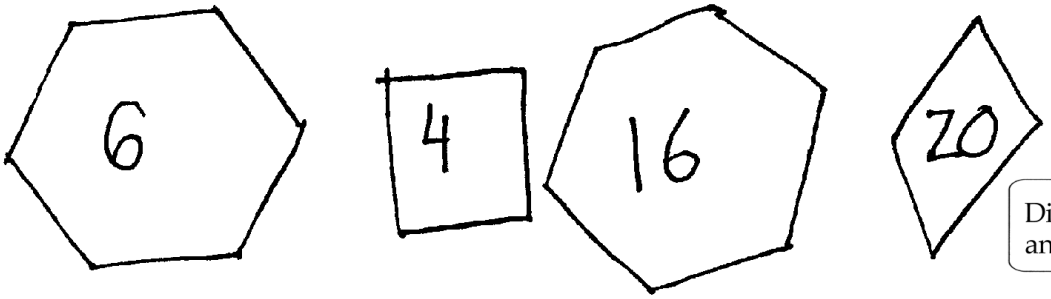


Z: "I first used 5 cause I .... don't Rnow. Then 7 8" (I wrote) "I didn't do either one of those." (He uses # chart -order) "I got 10, 11 then twelve and that one I forget (20)"

Apprentice



Practitioner



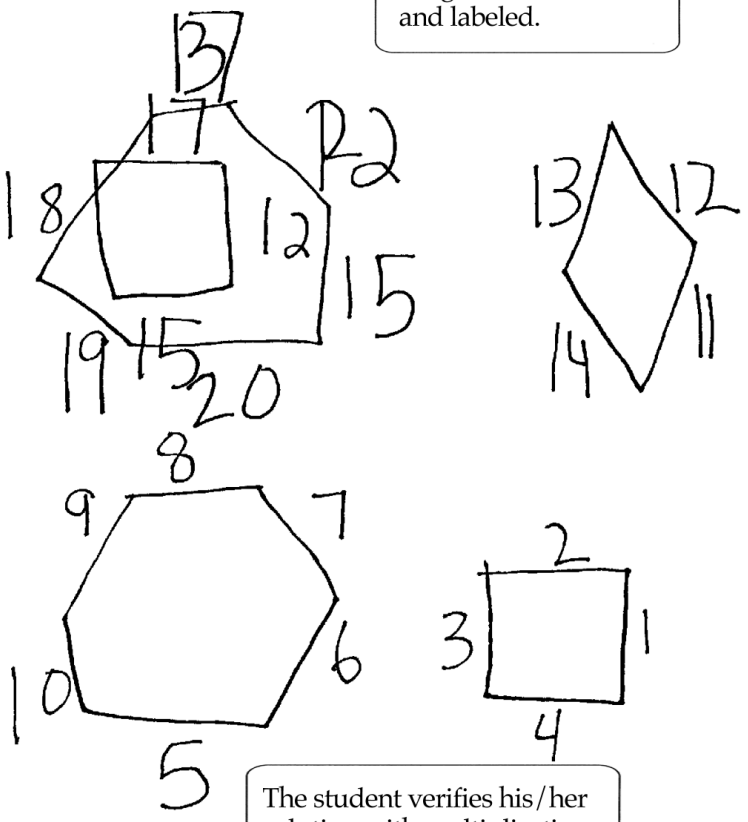
Diagrams are labeled and appropriate.

I did a hexagon. I counted 6 people could sit there. Then I did a square (4) Then I had ten people. I did another hexagon. I counted that I had sixteen. Then I did one triangle, 4 sides, I had 20. (she meant parallelogram)

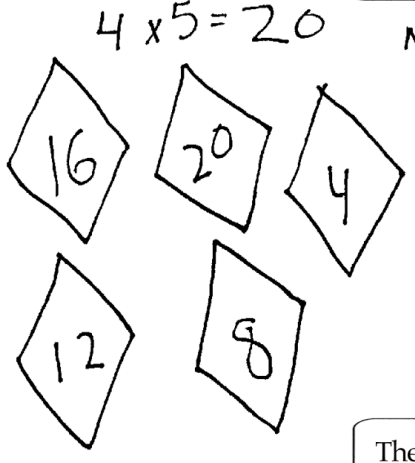
A correct solution is obtained.

Expert

Diagrams are accurate and labeled.



The student verifies his/her solution with multiplication.



N: I knew there were four 1's in each diamond. I added up until I got to twenty.

T: How did you know how to use mult.?

N: Because we learned that in Shared Lang. when we did another one of these.

The student obtains multiple correct solutions.