

Mrs. Hasson's Decorating Dilemma

Mrs. Hasson wanted to tile the floor in her kitchen using pieces like your Base-5 pieces. They were sold in bundles of 1 strip and 4 units. She needs the equivalent of 2 strip-mats to tile her floor. How many bundles will she need to buy?

Exemplars

Mrs. Hasson's Decorating Dilemma

Suggested Grade Span

3-5

Task

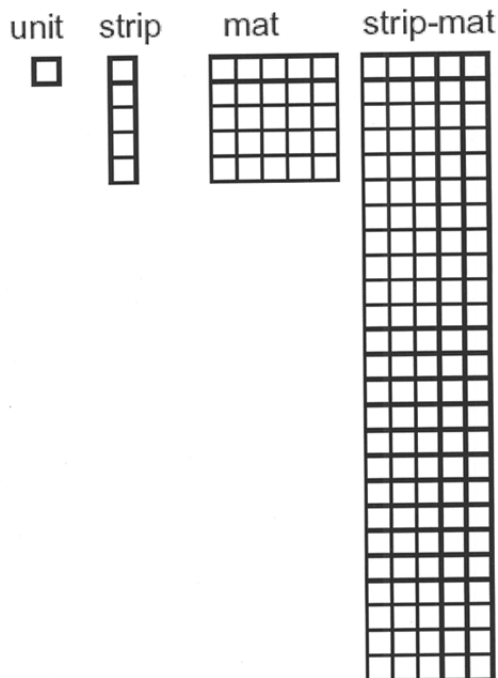
Mrs. Hasson wanted to tile the floor in her kitchen using pieces like your Base-5 pieces. They were sold in bundles of 1 strip and 4 units. She needs the equivalent of 2 strip-mats to tile her floor. How many bundles will she need to buy?

Alternate Versions of Task

More Accessible Version:

Mrs. Hasson wanted to tile the floor in her kitchen using pieces like your Base-5 pieces. They were sold in 1 strip pieces. She needs the equivalent of 2 strip mats to tile her floor. How many strips will she need to buy?

Base 5 pieces:



Exemplars

More Challenging Version:

Mrs. Hasson wanted to tile the floor in her kitchen using pieces like your Base-5 pieces. They were sold in bundles of 1 strip and 4 units. She needs the equivalent of 2 strip-mats to tile her floor. How many bundles will she need to buy?

If the bundles of tiles cost \$4.79, or can be purchased at 55 cents a unit, which will be least expensive way to purchase them?

Context

As part of our study of numeration, this task was given to students after experimenting with and doing activities involving Base-5 pieces (see below). A strip-mat is equal to 125 units, a mat is equal to 25 units, a strip is equal to five units and a unit is equal to one.

Working with Base-5 pieces enhances student's understanding of base-10. Base-5 pieces are similar to base-10 in that both pieces are structured in similar ways. One set involves grouping by fives and the other by 10s. Since only five units are needed to make a strip, regrouping opportunities happen much more frequently. Students will also understand the concept of minimal collections (the fewest number of pieces used to represent a particular number) more easily if they experience them in different settings. A similar activity can be designed using "chip trading" manipulatives, although I find students have a more concrete understanding of how each piece is related using Base-5 pieces.

Base-5 pieces:

Since I believe in giving students choice in their problem-solving activities, I also offered the following problem which also utilizes Base-5.

A teacher gave his children Base-5 pieces just like the ones you have been using. There was an unlimited supply of pieces. He asked his children to form a collection for 58 units. Each child formed a collection. Each collection was different from every other collection and every possible collection was formed. How many children did the teacher have in his class?

Source: *Opening Eyes to Mathematics*, The Math Learning Center©, 1993.

Students chose the problem that most attracted them.

What This Task Accomplishes

Mrs. Hasson's Decorating Dilemma allows students to explore the number nine (one strip and four units) by constructing meaning through the use of physical materials. Since this problem can be solved using manipulatives or sketches, as well as by using the division algorithm, all students can be successful at their individual levels. When using the division model, a remainder is involved, which helps students gain an understanding of remainders and their meaning. When solving the problems using manipulatives and sketches, many patterns and

Exemplars

relationships evolve, lending themselves well to helping children extend their solutions and make connections. This task also provides students with a real-world application of the skills they have been developing in class.

What the Student Will Do

Some students will jump right in with an algorithm, while others will need to utilize manipulatives. The best solutions are those which combine the two approaches and include an explanation of student reasoning. Those who jump right to an algorithm grapple with the remainder and its meaning. Students who utilize manipulatives may make errors in counting. When they compare their work with that of a peer, they may realize the discrepancy and end up going back and rechecking their work. This lends itself well to discussing how a blend of approaches will lead to the most certainty in reliability. Many students will realize patterns in their solutions as they are working and should be encouraged to record their observations as they go. Others may realize patterns and rules by extending their solutions after working the problem.

Time Required for Task

2 - 3 hours

Interdisciplinary Links

This activity is primarily mathematical in nature. Art could be incorporated if students were to take their bundles and design an appealing floor tile pattern. If color-coded, students could figure the number of bundles of each color Mrs. Hasson would need to buy, which may effect the student's original solution.

Teaching Tips

I provided students with the following format with which to write their reports, as well as how I would assign them a grade:

Base-5 Problem Solving

OUTLINE AND CRITERIA

Paragraph 1:

Briefly describe the task in your own words. Perhaps tell what you were thinking when you first started the problem. You could also tell how you have been using Base-5 pieces in class.

Paragraph 2:

Describe the process you went through to solve the problem. Be sure to include what worked and what did not work. Tell the whys behind your key decisions.

Mrs. Hasson's Decorating Dilemma

Exemplars

Paragraph 3:

Describe your solution and how you know it is accurate.

Paragraph 4:

What did you notice about your solution or an aspect of your solution? Did you notice any patterns or connections to other math? Can you make the task more complicated and solve it again? How is this problem like any others you have done? In what ways? Can you come up with any special rules or formulas?

Your representation should...

- Be on 8 1/2 x 11 inch paper;
- Have an accurate and appropriate title;
- Be labeled;
- Be accurate and carefully executed;
- Be creative;
- Be neat;
- Have good spelling; and
- Be communicated clearly.

Grading:

Your work showed how well you...

- 20 points ... Understood the problem and obtained an accurate solution
- 20 points ... Utilized a good strategy for solving the problem that is explained (you tell why you did what you did)
- 20 points ... Attempted to extend your solution (see paragraph 4)
- 20 points ... Used a wide variety of math language accurately and appropriately
- 20 points ... Used an accurate and appropriate representation

Total 100 pts.

Suggested Materials

- Base-5 Pieces
- Stencils
- Base-5 outline masters
- Rulers
- Calculators
- Stickers
- Chart paper
- Graph paper

Exemplars

- Colored paper
- Markers, crayons, etc.

Possible Solutions

Mrs. Hasson would need to purchase 28 bundles. She would use 27 full bundles and $\frac{7}{9}$ of the 28th bundle, with 2 units left over.

More Accessible Version Solution:

Fifty strips would be needed.

More Challenging Version Solution:

Mrs. Hasson would need to purchase 28 bundles. She would use 27 full bundles and $\frac{7}{9}$ of the 28th bundle, with 2 units left over.

$$28 \text{ bundles} \times \$4.79 = \$134.12$$

$$250 \times .55 = \$137.50$$

So it is least expensive to buy the tiles by the bundle.

Task Specific Assessment Notes

Novice

A Novice will need to use manipulatives as their primary strategy for solving the problem. Even with the help of manipulatives a Novice will not find an appropriate solution.

Apprentice

An Apprentice will use manipulatives as their primary strategy for solving the problem and may also utilize sketches to obtain a solution. The Apprentice will not achieve a full solution.

Practitioner

A Practitioner may use a combination of sketches and computation. The student may list the multiples of nine until they reach a number close to 250. These students may observe that if the floor was 243 or 252 units there would be no units remaining.

Expert

An Expert may jump right to the division algorithm and will correctly interpret the remainder. These students may discuss rounding decimals to the nearest whole number, prove their solutions are correct using another approach, or discover how many strip-mats the floor would be for there would be no remaining units (nine).