

Mathematics Governor's Institute 2003

Problem-in-a-bag

Title: Tiling on a Budget

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Grade Level/Course: Geometry (10th or 11th grade)

Concepts Used: Polygons, angles, patterns, area, perimeter, cost, estimating, relationships, modeling

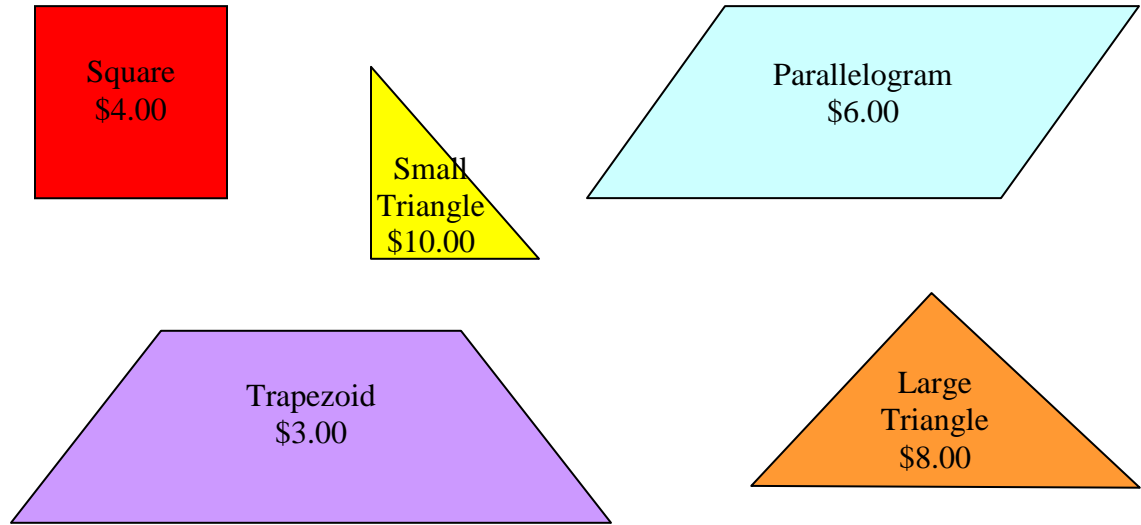
PA Standards Addressed: 2.2.11 (Computation & Estimation) A, B, E
2.3.11 (Measurement & Estimation) A
2.4.11 (Mathematical Reasoning & Connections) B, E
2.5.11 (Mathematical Problem Solving & Communication) A, C, D
2.9.11 (Geometry) A, H, I, J

NCTM Standards:

- Understand meanings of operations and how they relate to one another
- Compute fluently and make reasonable estimates
- Analyze characteristics and properties of two and three dimensional geometric shapes and develop mathematical arguments about geometric relationships
- Apply transformations and use symmetry to analyze mathematical situations
- Use visualization, spatial reasoning and geometric modeling
- Build new mathematical knowledge through problem solving
- Solve problems that arise in mathematics and in other contexts
- Apply and adapt a variety of appropriate strategies to solve problems
- Monitor and reflect on the process of mathematical problem solving

Introduction/Application: You have decided to cover the 9' x 12' floor in your new home with tile.

Question: After reviewing your budget, you determine that you can spend no more than \$200 for the job. The home improvement store offers five different shapes of tile at various costs (see below). This week they are running a sale; if you select three or more types of tile, delivery is free. You decide to take the offer.



Model: -9" x 12" grid board (1/4" scale)
-Foam shapes as previously described

Resources and Materials/Estimated Cost:

Do-It-Yourself Kit
Estimated cost \$5.00

-Minimum of six 9" x 12" pieces of colored foam (for shapes)

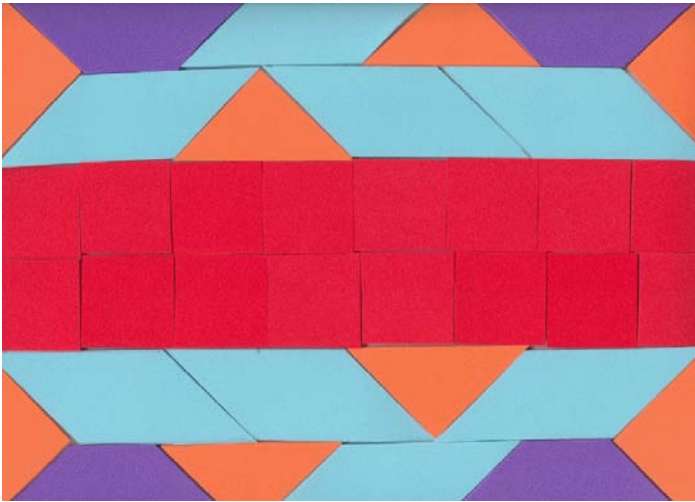
-9" x 12" grid board (scale model of room)

Pre-fabricated, commercially sold, wooden tiles and grid board

Estimated cost \$15-\$23

Procedures and Activities: -Trial and error/estimation to determine patterns that fit grid board
-Multiplication & addition to determine cost
-Reassess technique to achieve acceptable cost requirement

Possible Solutions:



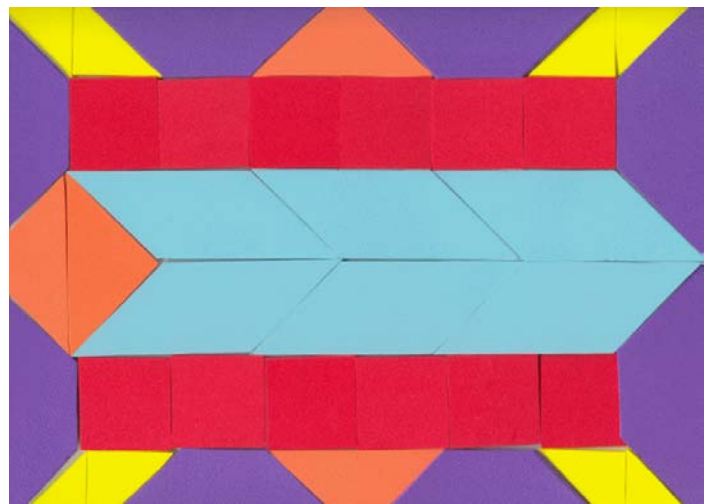
\$64.00--16 red squares
 \$48.00--8 blue parallelograms
 \$12.00--4 purple trapezoids
\$64.00--8 orange large triangles
 \$188.00—Total cost



\$16.00--4 red squares
 \$60.00--10 blue parallelograms
 \$12.00--4 purple trapezoids
 \$96.00--12 orange large triangles
\$80.00--8 yellow small triangles
 \$264--Total cost (*did not meet req's*)



\$24.00--6 red squares
 \$54.00--18 purple trapezoids
\$48.00--6 orange large triangles
 \$126.00—Total cost



\$48.00--12 red squares
 \$80.00--8 yellow small triangles
 \$32.00--4 orange large triangles
 \$24.00--8 purple trapezoids
\$36.00--6 blue parallelograms
 \$220—Total cost

Accommodations/Adaptations: **ESL:** -Read and clarify directions and procedures in native language

Special Education: -Read and clarify directions and procedures and model example(s).

Enrichment: -Decrease the total amount of money you have available
-Increase/decrease the cost of each shape
-Increase/Limit the number of shapes
-Increase/Change the type of shapes
-Compute the area/perimeter of the shapes
-Ratio of the area of one shape type to the total area
-Determine angles and slopes for the shapes
-Use the cost/ft² minimize the total cost
-Require symmetry or unique color patterns

Notes:

1.) *This project was designed for 10th/11th grade. If it is being used for other grade levels, other standards may be addressed.*

2.) *Attached is a template of the five shapes used for this project.*

