Anne Bernadette's tile

BETH BLACKALL
Doctoral Student, University of Alberta
Edmonton, Alberta

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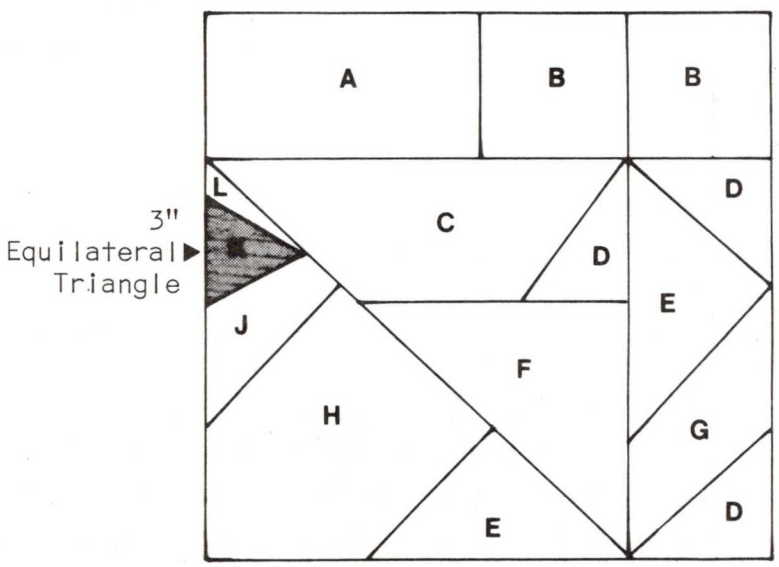
Anne Bernadette's Tile came into being when a young teacher from the area of business education was presented with a Grade VII mathematics class which did not seem to appreciate textbook teaching. Each pupil was asked to acquire a tile which he ruled and cut, a useful mathematical exercise in itself. The students enjoyed manipulating their sets of shapes as they learned about classification of shapes, area, perimeter, the identification and measurement of angles and algebraic equations. As a bonus, the set quite fortuitiously contained a 5-piece tangram.

The Tile has since been used by teachers from Grade I right through elementary school, to give children experience in matching and sorting, ordering, value relations, fractions, dissections as well as the topics previously mentioned. There seems to be no end to the variety of activities arising from the use of this simple set of shapes.

MATERIALS

A 12" x 12" floor tile, cut to the pattern below.

For the purpose of identifying the various pieces for the reader, the shapes have been labeled A to L.



SOME CHARACTERISTICS OF ANNE BERNADETTE'S TILE

1. The oblong (A), largest triangle (F) and the trapezoid (C) are equal in area.
2. The square (B), triangle (E) and parallelogram (G) are equal in area.
3. The triangle (E) together with two of the smallest triangles (D) will make up the oblong (A), the largest triangle (F) and the trapezoid (C).
4. The square (B) together with two of the smallest triangles (D) will make up the oblong (A), the largest triangle (F) and the trapezoid (C).
5. The parallelogram (G) together with two of the smallest triangles will make up the oblong (A), the largest triangle (F) and the trapezoid (C).
6. Two of the smallest triangles (D) will combine to form the square (B), the triangle (E) and the parallelogram (G).
7. The triangles (D,E,F) are similar.
8. The three shapes (J,K,L) can be rearranged to show the difference between area and perimeter.
9. The angles of the shape (L) are 120°, 45° and 15° or 1/3 turn, 1/8 turn and 1/24 turn.
10. The angles of the shape (J) are 45°, 90°, 105° and 120° or 1/8 turn, 1/4 turn, 7/24 turn and 1/3 turn.
11. The following pieces form the 5-piece tangram: square (A), triangle (E), parallelogram (G), 2 of the smallest triangles (D).

SOME ACTIVITIES

1. Take a big piece. Cover it with smaller pieces. Can you do it a different way? Is there still another way you can do it?
2. Start with any piece. Next to any side, place another piece so that the 2 edges are matched in length. Try to make your trail as long as possible. Example:

3. Share the pieces with a friend, and play the last game with him taking it in turns.
4. Sort (classify) the shapes according to number of sides, number of equal sides, number of square corners (right angles).
5. Choose a value for the small triangle (D). Work out what all the other shapes are worth (leave out J, K, L). Now choose another value for (D) and repeat.
6. Write equations using the numbers you worked out for the last activity.
7. After you know something about fractions, let the oblong (A) be worth one. Can you work out what some of the other shapes are worth? Do the same exercise when the trapezoid (C) is worth one.

8. Let the pentagon (H) be worth one; what are the other shapes worth? Can you write equations using these fractions as numbers?
9. Find 2 shapes equal in area but different in perimeter.
10. Make 2 shapes equal in perimeter but different in area.
11. Find pairs of shapes equal in both area and perimeter. In what respect are they different?
12. Order the shapes according to area from smallest to largest.
13. Order the shapes according to perimeter from shortest to longest.
14. Take the parallelogram (G). Give an accurate statement about its perimeter.
    [2 long (sides) + 2 short (sides)]
    [2 longs + 2 shorts]
    [2 L + 2 S]
    Using these terms, give accurate statements about the perimeter of the other pieces. (L and J are regarded as too difficult.)
15. Take the 5-piece tangram. Form these pieces into a square, a triangle, a parallelogram, a rhombus, a trapezoid, a pentagon, a hexagon.
16. Using any 3 of the tangram pieces at a tin, try to make the shapes listed in the previous activity. How many of the shapes can you make with any 4 of the pieces? Any 2?
17. Take the triangle (E) and the parallelogram (G). Make them into a 4-sided figure. How far around is this shape? Make the same 2 pieces into a 5-sided figure. How does the perimeter of this shape compare with that of the 4-sided figure? Now make a 6-sided figure with the same perimeter.
18. Make a dot on a piece of paper. Arrange some pieces so that their corners fill in a complete turn at that point. Try other combinations of pieces.
19. Find 4 corners of equal size, which together will make a complete turn around a dot. How much of a full turn does each corner measure?
20. Find 8 corners of equal size which together will make a complete turn around a dot. How much of a full turn does each corner measure?
21. Can you work out the fractions of a full turn (or revolution) that each corner on all the shapes measure?
22. Write an equation to show how much all the corners on any shape add up to. Can you see a pattern in your answers?
23. Use the following pieces to form a square: C, D, E, F, H, J, K, L.
24. If you tried to make the shapes left over from the previous activity into a square, would you succeed? What shape must you add?
25. What is the biggest triangle you can make? Use as many pieces as you like.

COMMENTS

1. The activities range from easy to difficult, so that Grade I pupils could do some, while junior high school students would be challenged by others.

2. The tile described is listed as 12" x 12". Now that Canada is going metric, a better dimension for the square may be 40 cm. Thus the equilateral triangle (K) and the square (B) would have 10 cm. sides.

3. A 7-piece tangram can be formed by adding to the 5-piece tangram, 2 of the largest triangle (F).