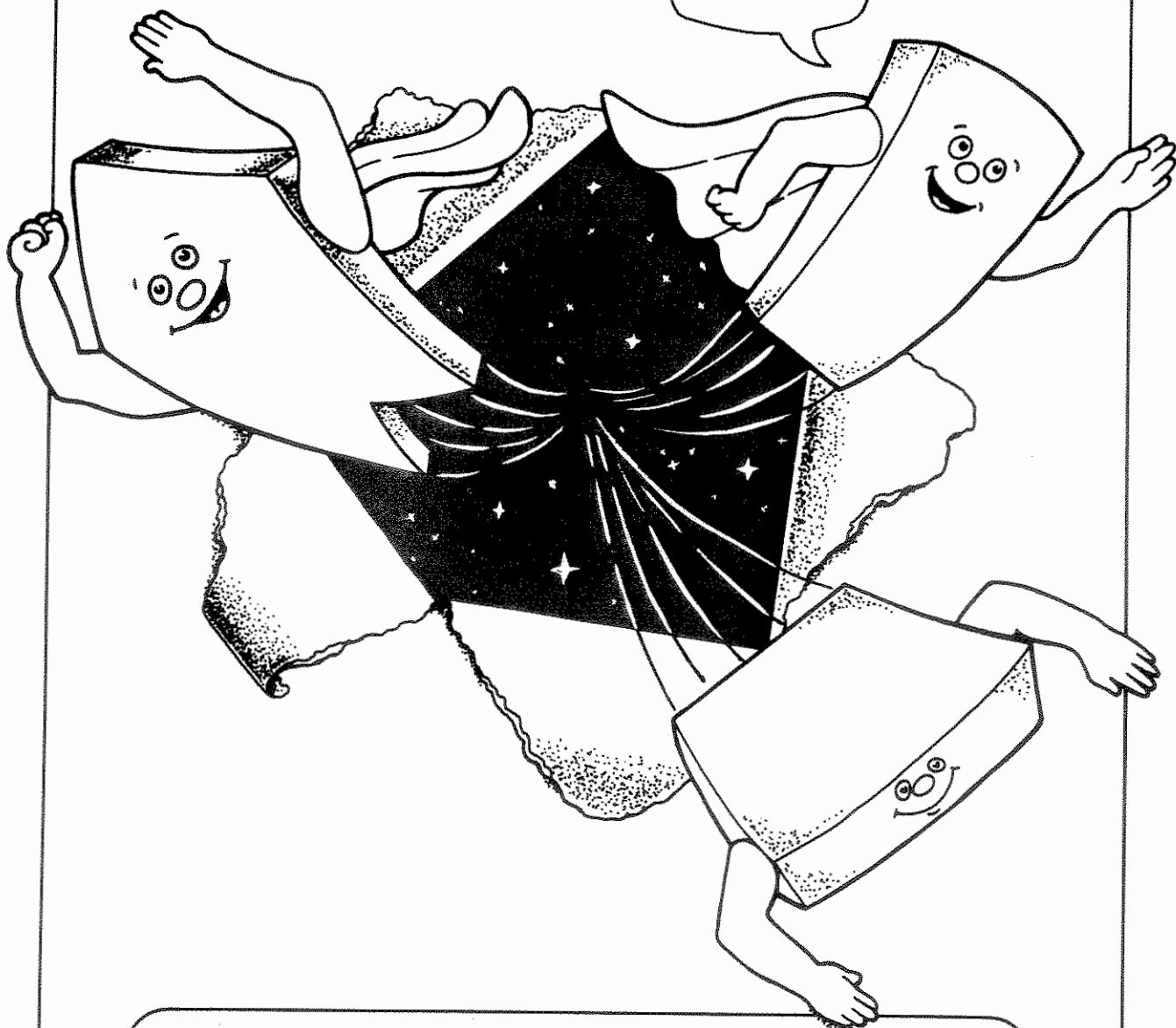


SUPERTANGRAMS

For Beginners

2



Henri Picciotto • MathEducation.page

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For more activities involving superTangrams and related shapes, see
MathEducation.page/puzzles/puzzles.html

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Edited by Ann Roper

NOTES TO THE TEACHER

SuperTangrams™ are the geometric shapes that are formed by joining four isosceles right triangles (half-squares) edge-to-edge. They are called SuperTangrams™ because their underlying geometry is that of the old Chinese tangram puzzle. In fact, three of the SuperTangrams™ are identical to three of the tangram pieces. As with the tangrams, you can combine the SuperTangrams™ in an infinite number of ways to create various shapes.

Like tangrams, and pentominoes (to which they are also related), the SuperTangrams™ offer a recreational approach to many mathematical questions. Solving the puzzles can help students develop their intuitive feel for two-dimensional space, which will provide a solid foundation for the formal study of geometry.

Even students who have had experience with other geometric puzzles may find SuperTangrams™ quite challenging. There are two reasons for this. First, there are fourteen shapes, all different, whereas there are only seven tangram pieces in three different shapes. Second, because there are 45-degree and 135-degree angles, in addition to 90-degree angles, and the fact that all sides are not multiples of the same unit length, make the SuperTangrams™ trickier to put together than tangrams or pentominoes. With this in mind, the exercises in this book have been carefully designed to provide a step-by-step introduction to these exciting and brain-twisting shapes.

HOW TO USE THIS BOOK

You may want to keep copies of the puzzles in each set in separate folders. This will help keep them organized and make it easier for a student to work with a whole set at one time.

As much as possible, the puzzles are ordered by difficulty within each set, the easier ones coming first. The first puzzle in a set may be easier than the last one in an earlier set. If a student becomes frustrated, encourage him or her to try an easier puzzle.

Students may work through the pages in any order, but it is important that they keep track of their successes by marking on the checklist the puzzles they solve correctly. This allows students to see their progress, and motivates them to solve more puzzles.

For introductory activities for SuperTangrams™ see *SuperTangrams™ for Beginners: Book 1*. More difficult puzzles than those in the two beginner books are in *SuperTangram™ Activities: Book 1* and *Book 2*.

Learning the SuperTangram™ Names and Symbols

To remember the names of the pieces, it will help to learn the alphabetical sequence BCHPRST. For each letter there are two SuperTangrams™ represented by the capital and lower-case letters. You can add vowels to make up a phrase such as "BeaCH, PReSTo" or "BaCH, PRouST" to make the letters easier to remember.

Sets A, B, C (pages 5-7)

If students find other ways to make these figures, encourage them to record their discoveries. They can use these as additional challenges for their classmates.

Students will need to record their solutions to these puzzles on separate pieces of paper. Be sure there is enough paper available.

Set D (page 8)

Use this page only with older or gifted students. You will also need plenty of recording paper for these puzzles.

The Grid (page 9)

SuperTangram™ puzzles are impossible to solve if the pieces are not oriented correctly. Awareness of the grid that underlies the design of the pieces makes puzzle solving considerably easier. In sets E through G, the grid is drawn within the figures. This allows students to see immediately if they are placing a piece incorrectly. In other words, pieces should fit perfectly on the grid.

For example, if the grid is in the horizontal-vertical direction, as on page 38, the rectangle must be placed horizontally or vertically and the square must be placed diagonally. If the grid is in the diagonal direction, as on page 35, the rectangle must be placed diagonally and the square horizontally.

Set E (pages 10-16)

Note that these figures are blown up versions of seven SuperTangrams™. It is possible to make other SuperTangram™ shapes and shapes in other sizes.

Sets F, G (pages 17-38)

“Houses” are among the easiest shapes to make with SuperTangrams™. The houses in Set F are pentagons (five-sided), and the ones in Set G are hexagons (six-sided).

The Fourteen-Piece Puzzle (page 39)

Symmetric figures utilizing all fourteen SuperTangrams™ are very hard to make. (If you or your students discover some, please send them to the author.)

Use the shapes on page vi as patterns to make SuperTangrams™ or as a check to make sure you have a complete set. Assign students to check the sets periodically to see that they are complete.

NAME _____

CHECKLIST FOR THE SUPERTANGRAM™ PUZZLES

Use this checklist to keep track of which puzzles you have solved.

Set A Page 5
 1 2 3 4 5 6 7 8 9 10

Set B Page 6
 1 2 3 4 5 6 7 8 9 10

Set C Page 7
 1 2 3 4 5 6 7 8 9 10

Set D Page 8
 1 2 3 4 5 6 7 8 9 10

Set E
 Pages: 10 11 12 13 14 15 16

Set F
 Pages: 17 18 19 20 21 22 23 24

25 26 27

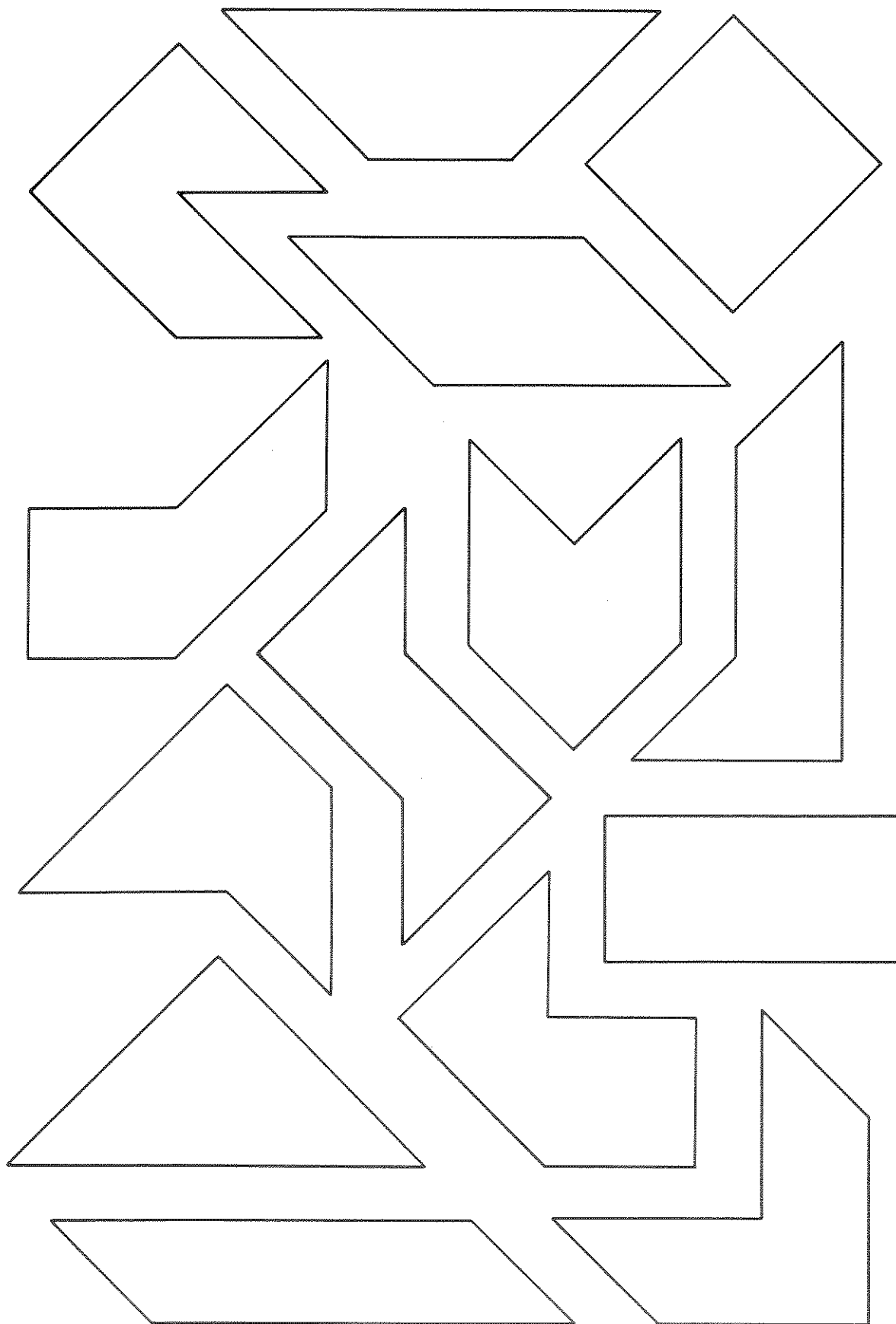
Set G
 Pages: 28 29 30 31 32 33 34 35

36 37 38

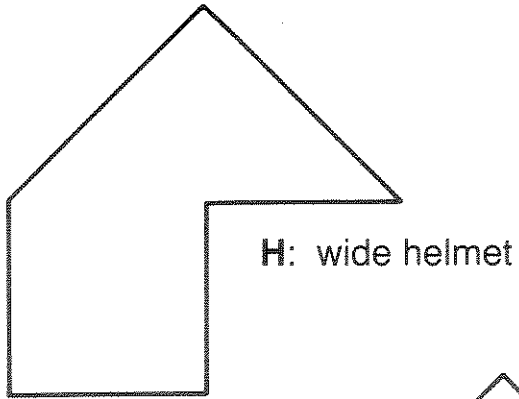
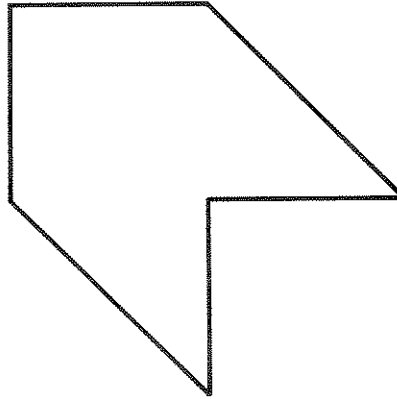
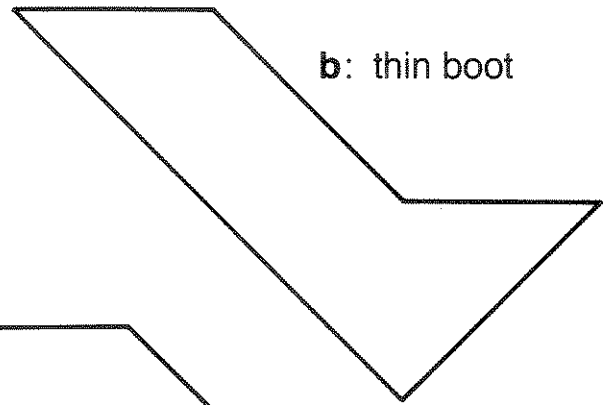
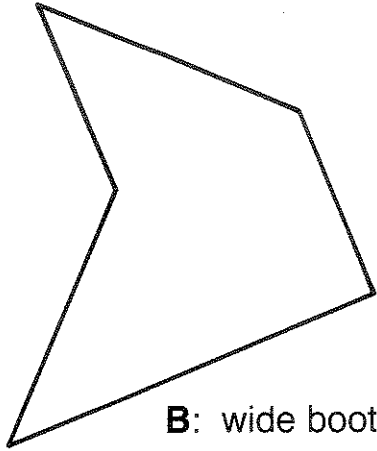
The fourteen-piece puzzle

Page: 39

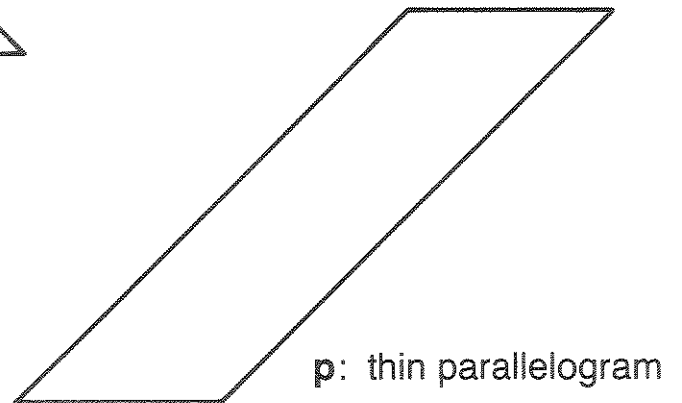
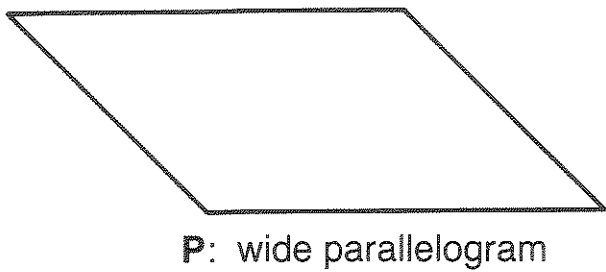
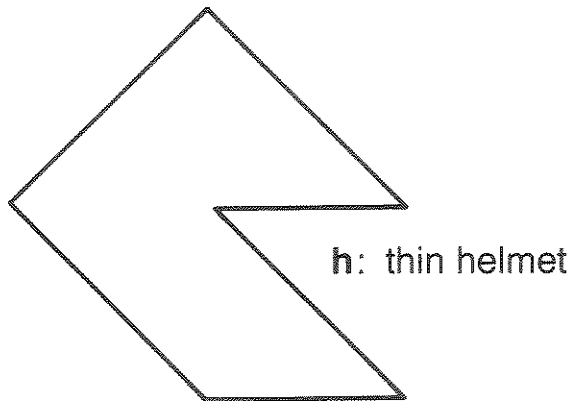
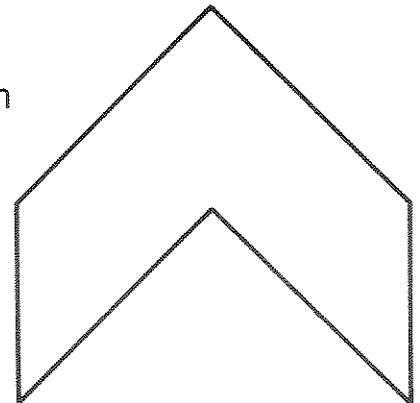
SUPERTANGRAM™ PATTERNS



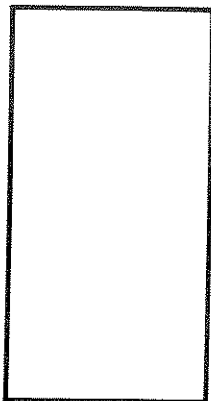
Each SuperTangram™ has a name and a letter symbol.
They are shown on this page and the next.



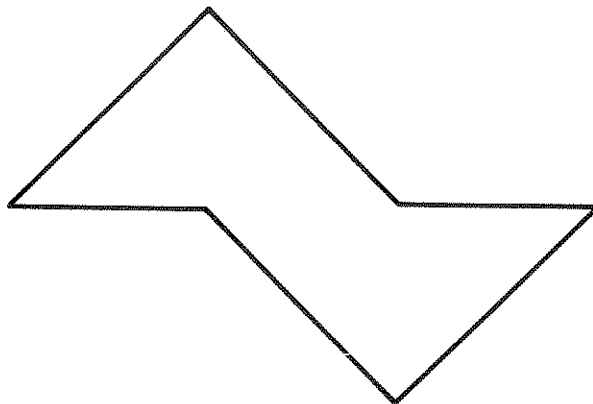
c: thin chevron



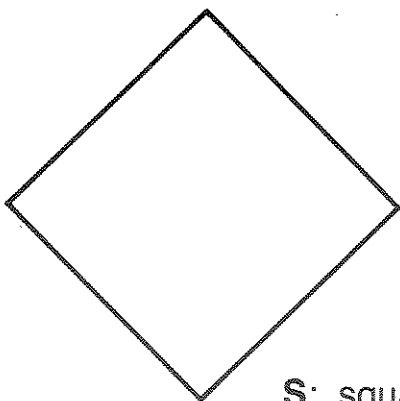
Each SuperTangram™ has a name and a letter symbol.



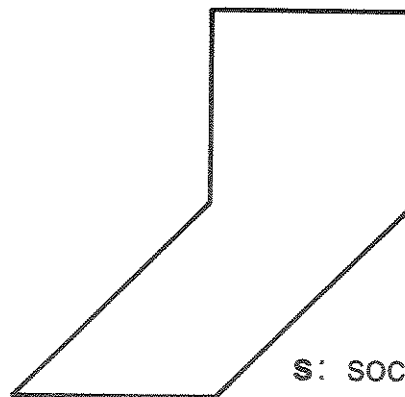
R: rectangle



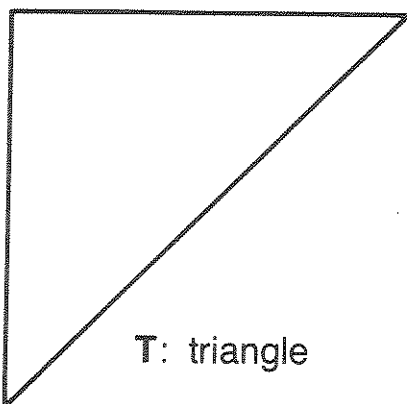
r: rotor



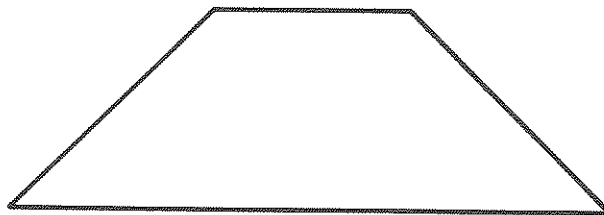
S: square



s: sock

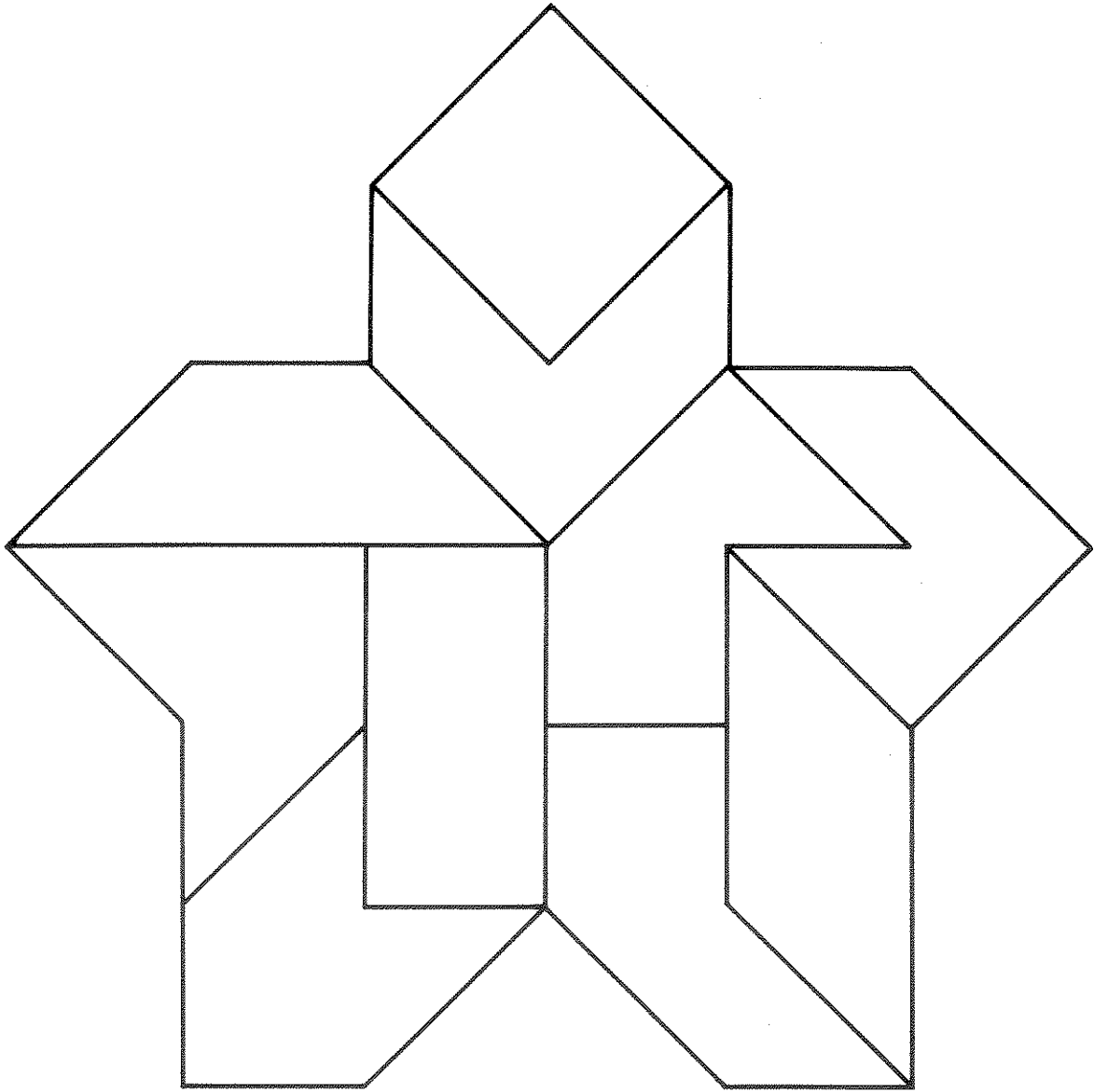


T: triangle



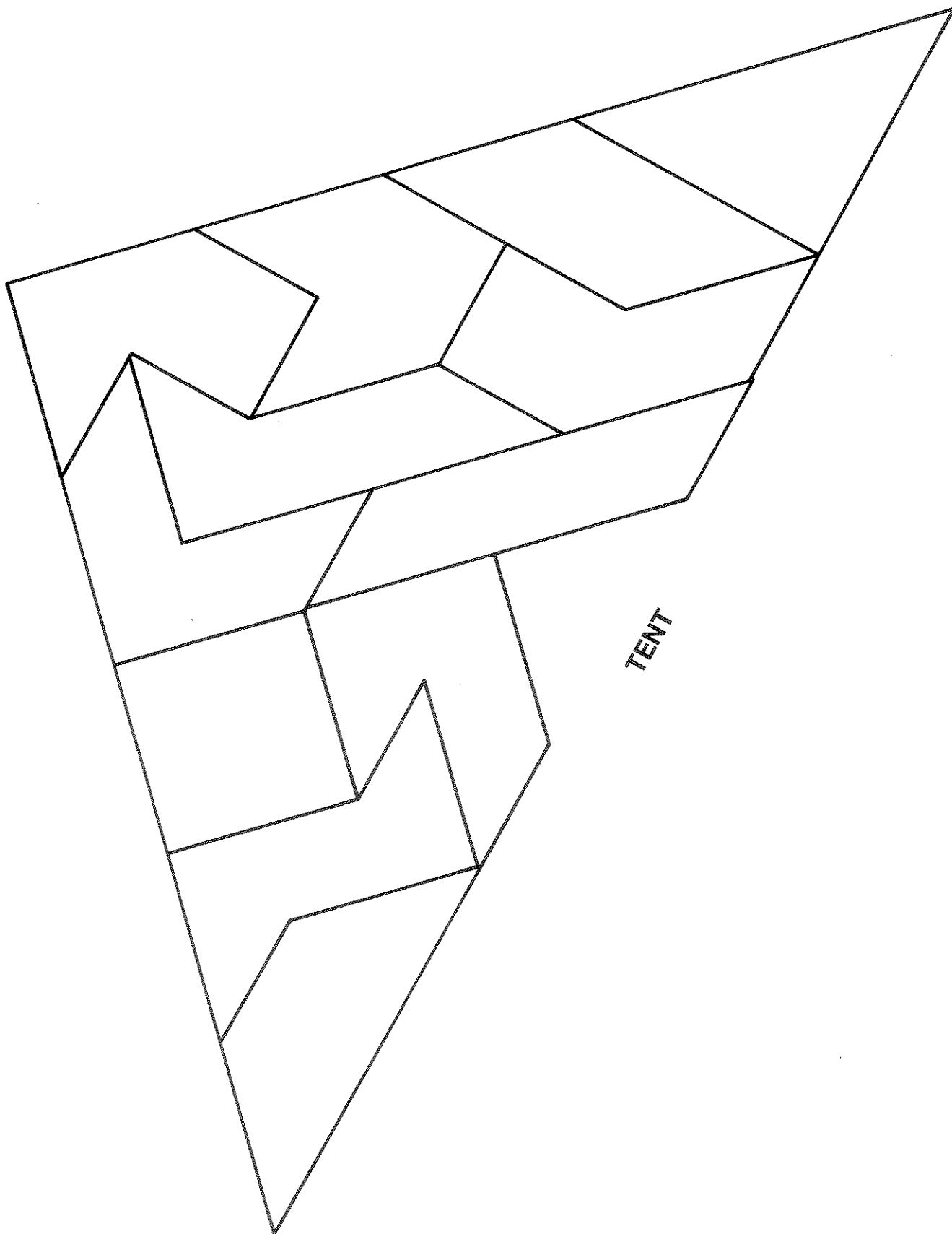
t: trapezoid

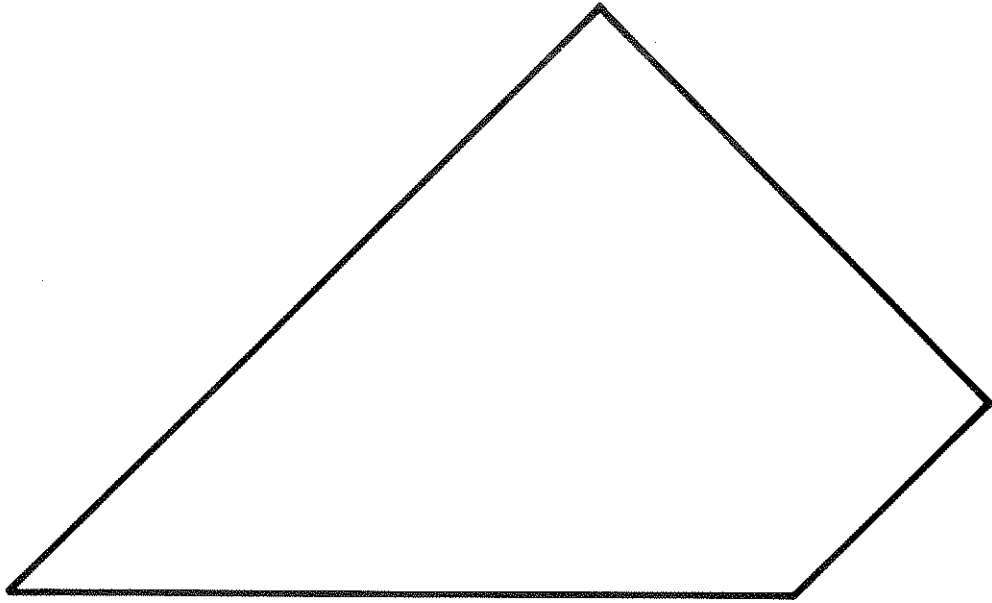
Write the letter symbol in each shape.
Cover the figure with SuperTangrams™



STAR

Write the letter symbol in each shape.
Cover the figure with SuperTangrams™.





Cover this figure in ten different ways.
Show your solutions on other paper.

1. BbPT

3. BbRT

5. BchT

7. BhST

9. chrt

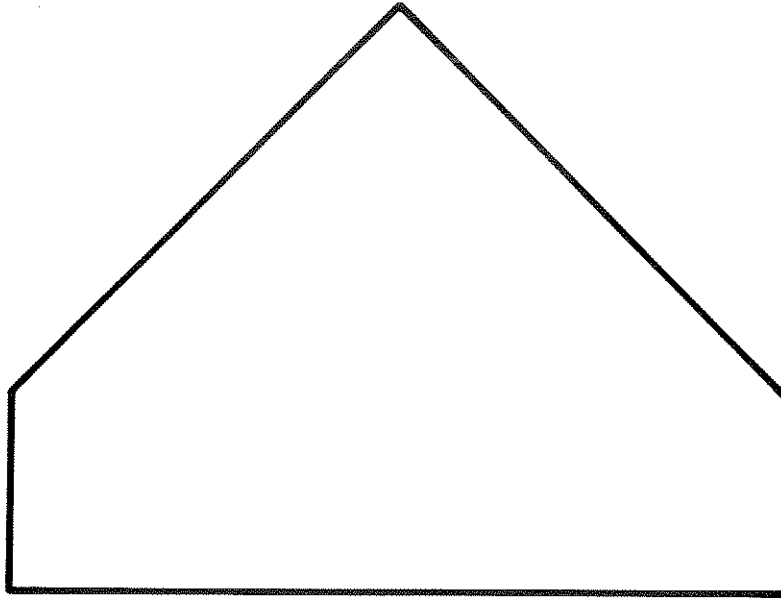
2. BbpT

4. bchP

6. bhPS

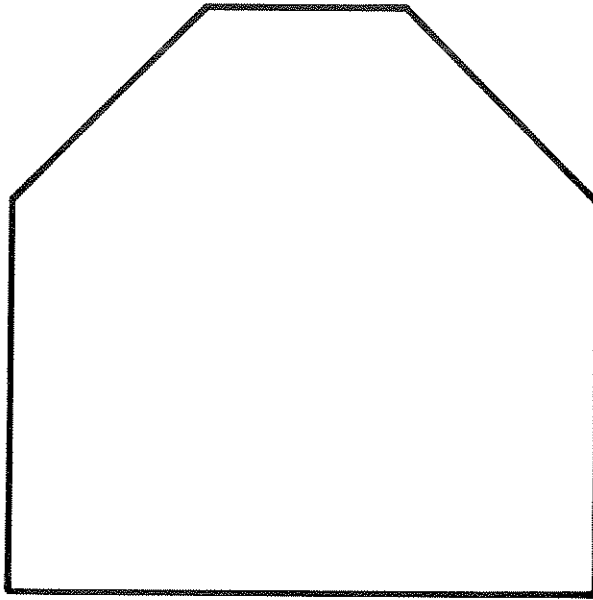
8. bprt

10. hrSt



Cover this figure in ten different ways.
Show your solutions on other paper.

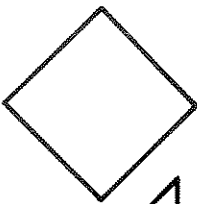
- | | |
|---------|----------|
| 1. BbCR | 2. BCch |
| 3. BCHs | 4. BCpt |
| 5. BHPs | 6. bHRs |
| 7. BHSs | 8. BpTt |
| 9. BRTt | 10. CHst |

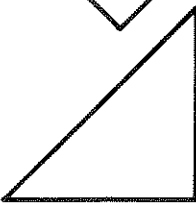


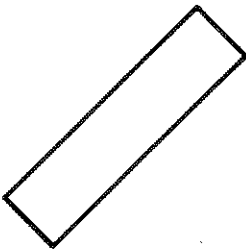
Cover this figure in ten different ways.
Show your solutions on other paper.

- | | |
|---------|----------|
| 1. BCPR | 2. bCRT |
| 3. BcST | 4. BHhs |
| 5. BPpT | 6. BPRT |
| 7. CchT | 8. CHsT |
| 9. HPsT | 10. HSsT |


Make the following figures with SuperTangrams™
 Show your solutions on other paper.

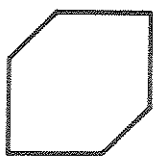
1. square  Use bchr.

2. triangle  Use BPTt.

3. rectangle  Use bhpS.

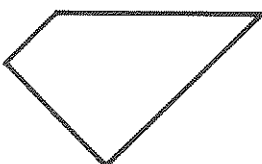
4. rectangle  Use BpTt.

5. parallelogram  Use bPpt.

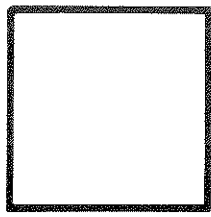
6. hexagon  Use BcHs.

7. hexagon  Use chPt.

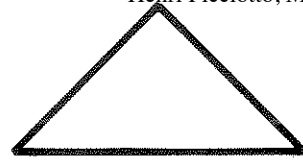
8. right trapezoid  Use bPTt.

9. right trapezoid  Use hrSt.

10. isosceles trapezoid  Use BRTt.

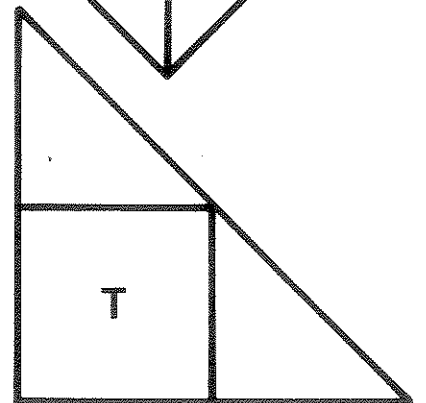
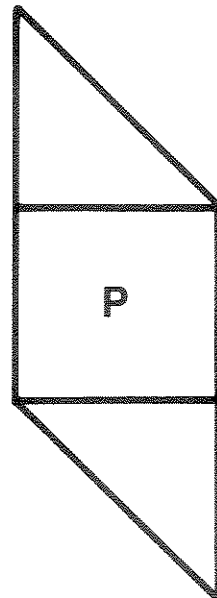
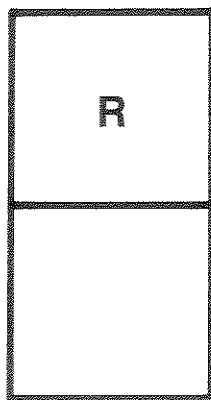
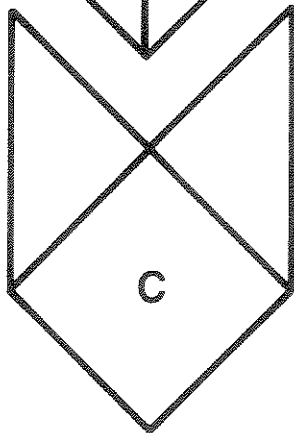
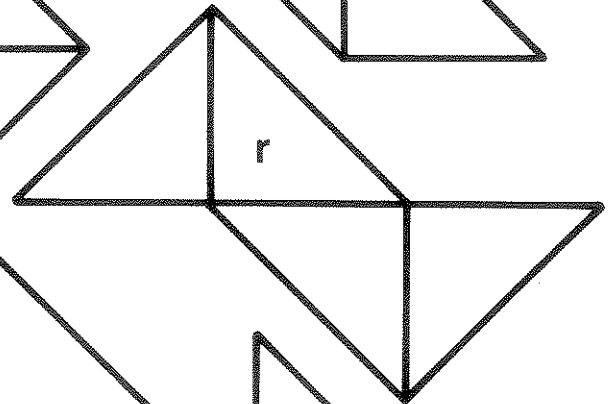
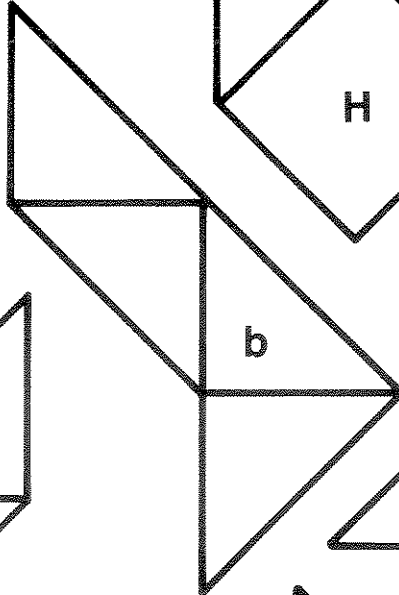
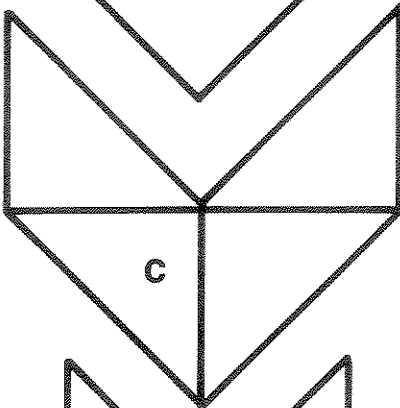
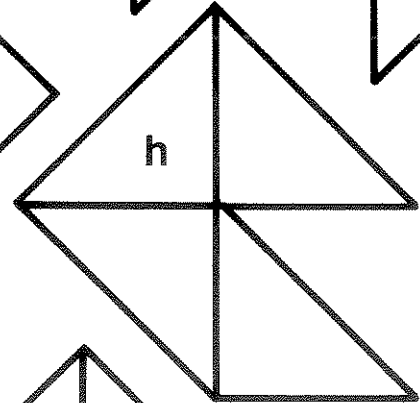
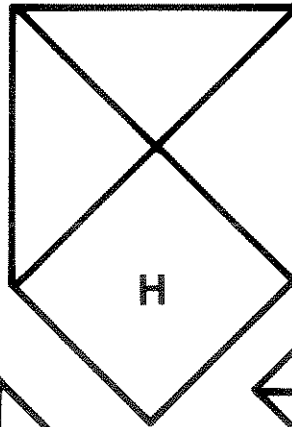
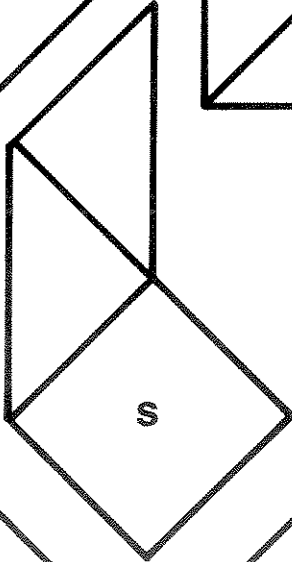
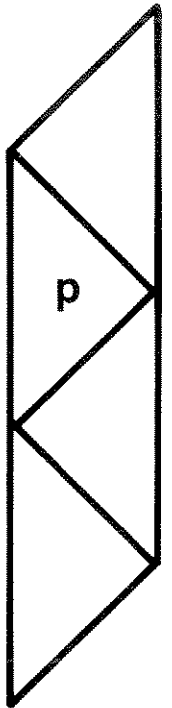
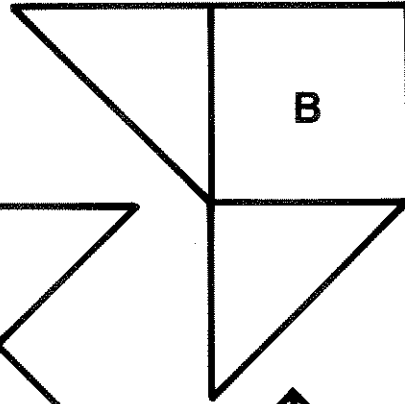
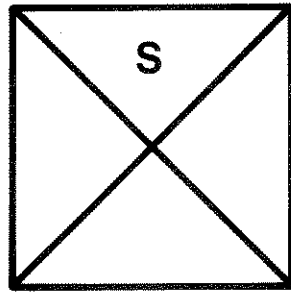
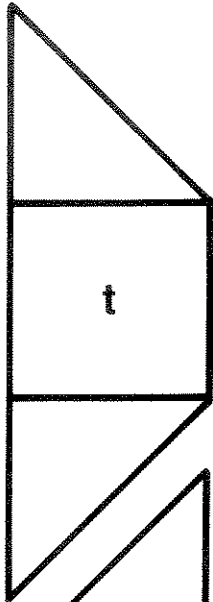


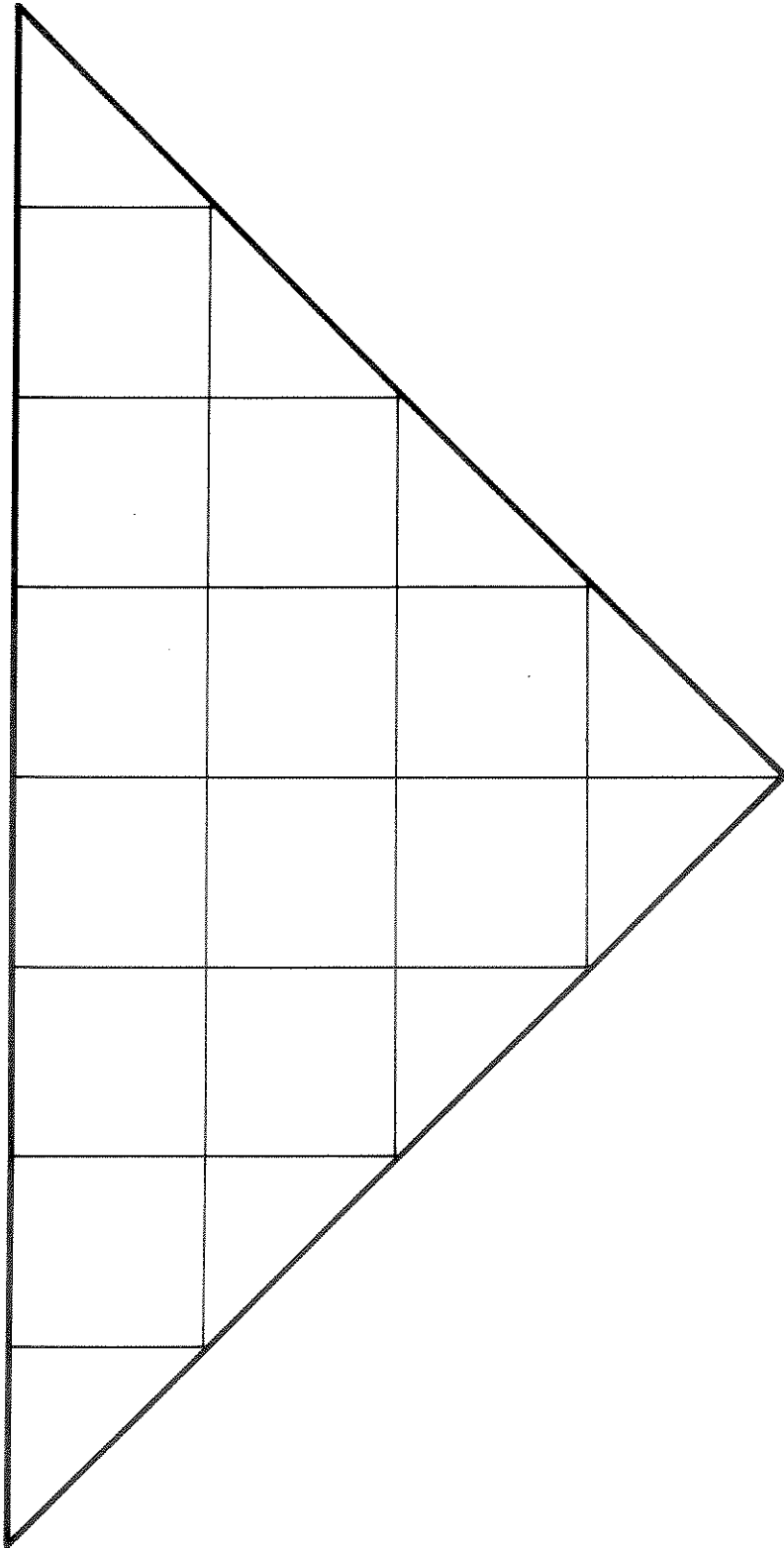
This is a square.

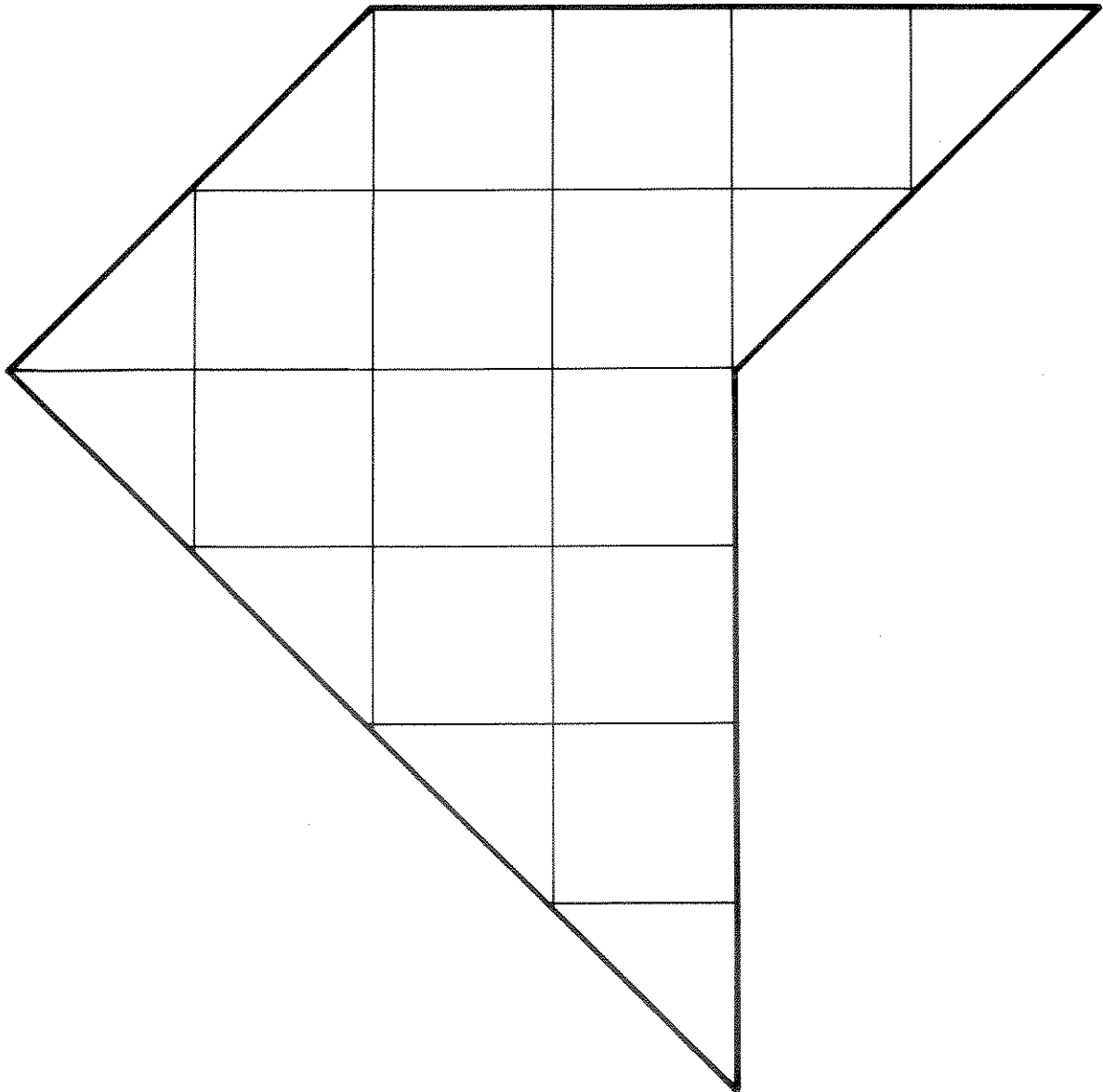


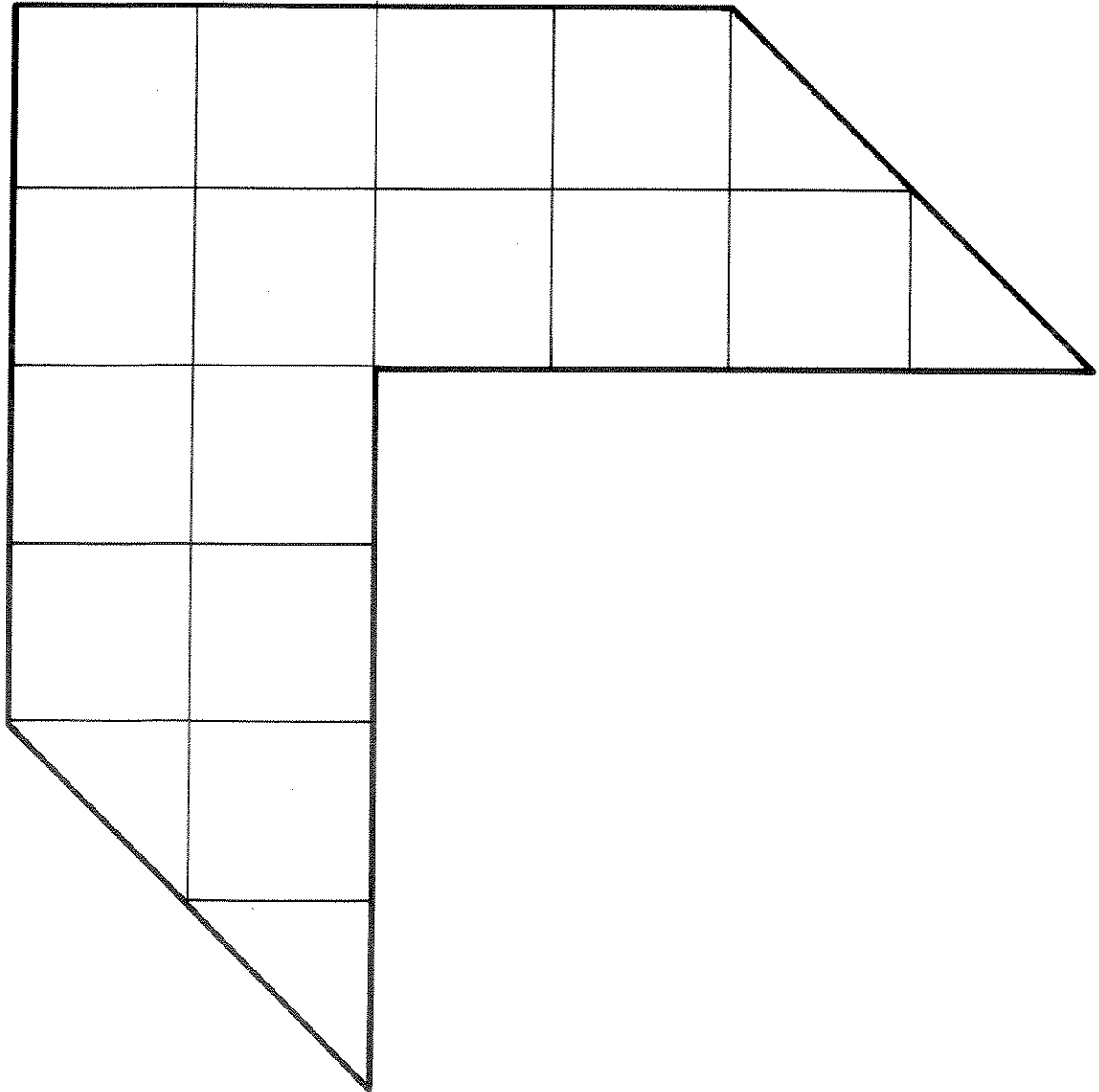
This is a half-square.

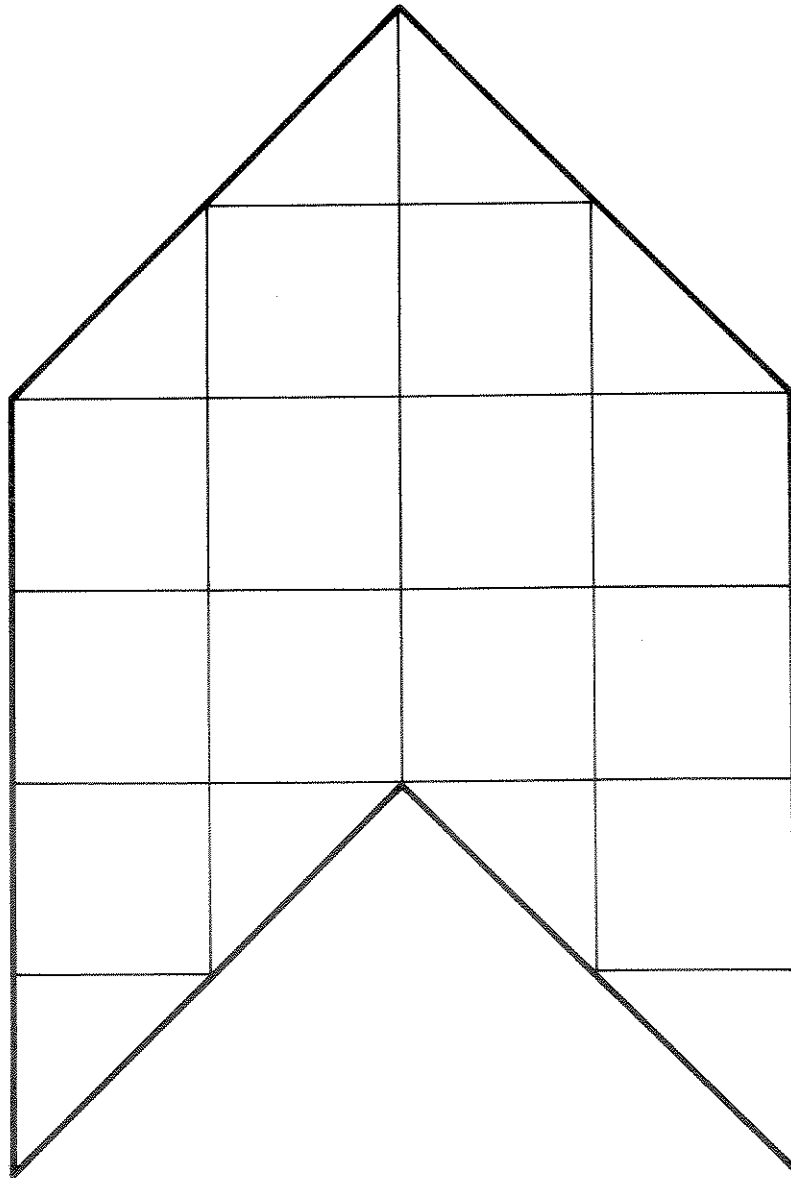
SuperTangrams™ are made of squares and half-squares.
Here are the 14 shapes.

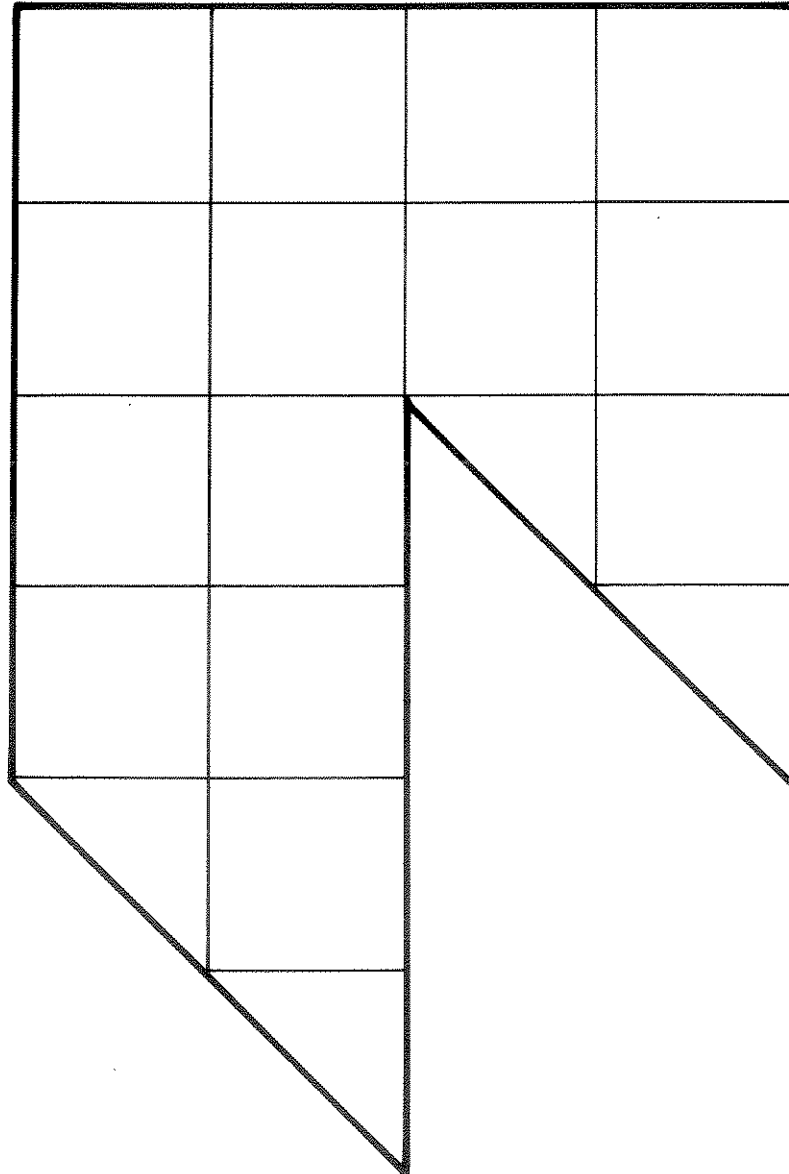


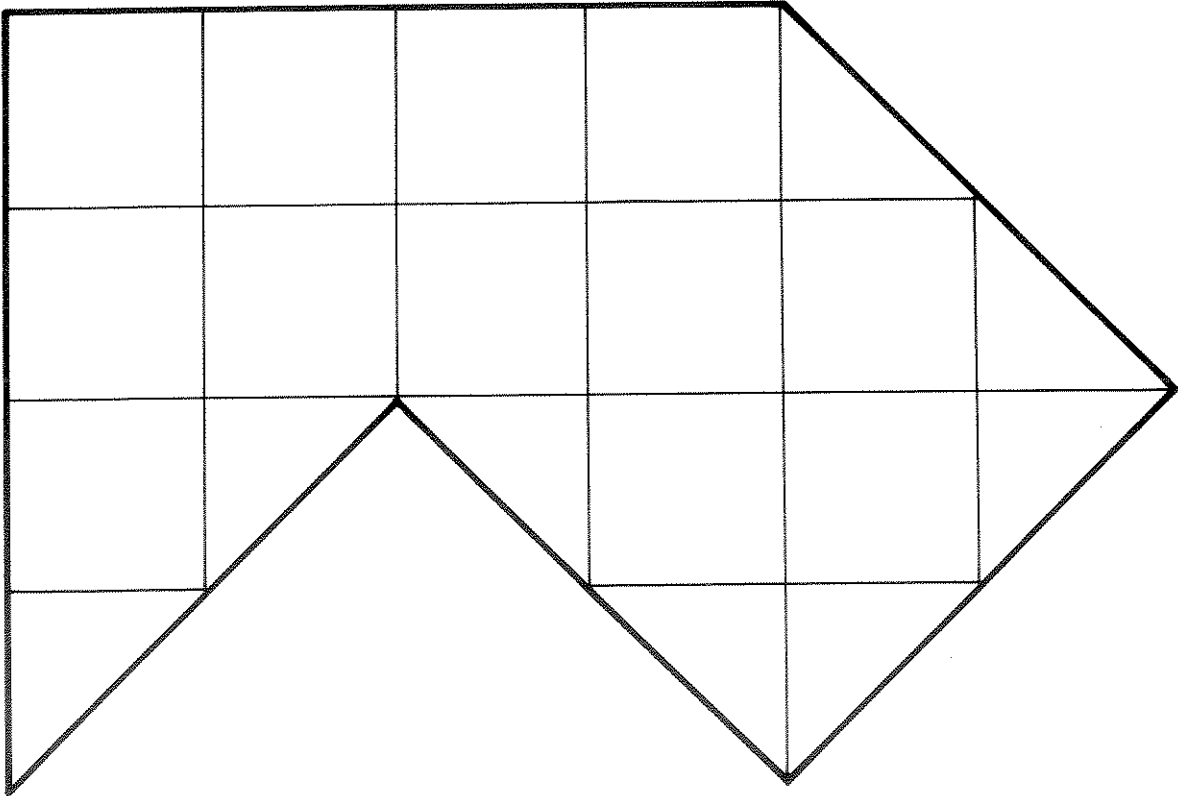


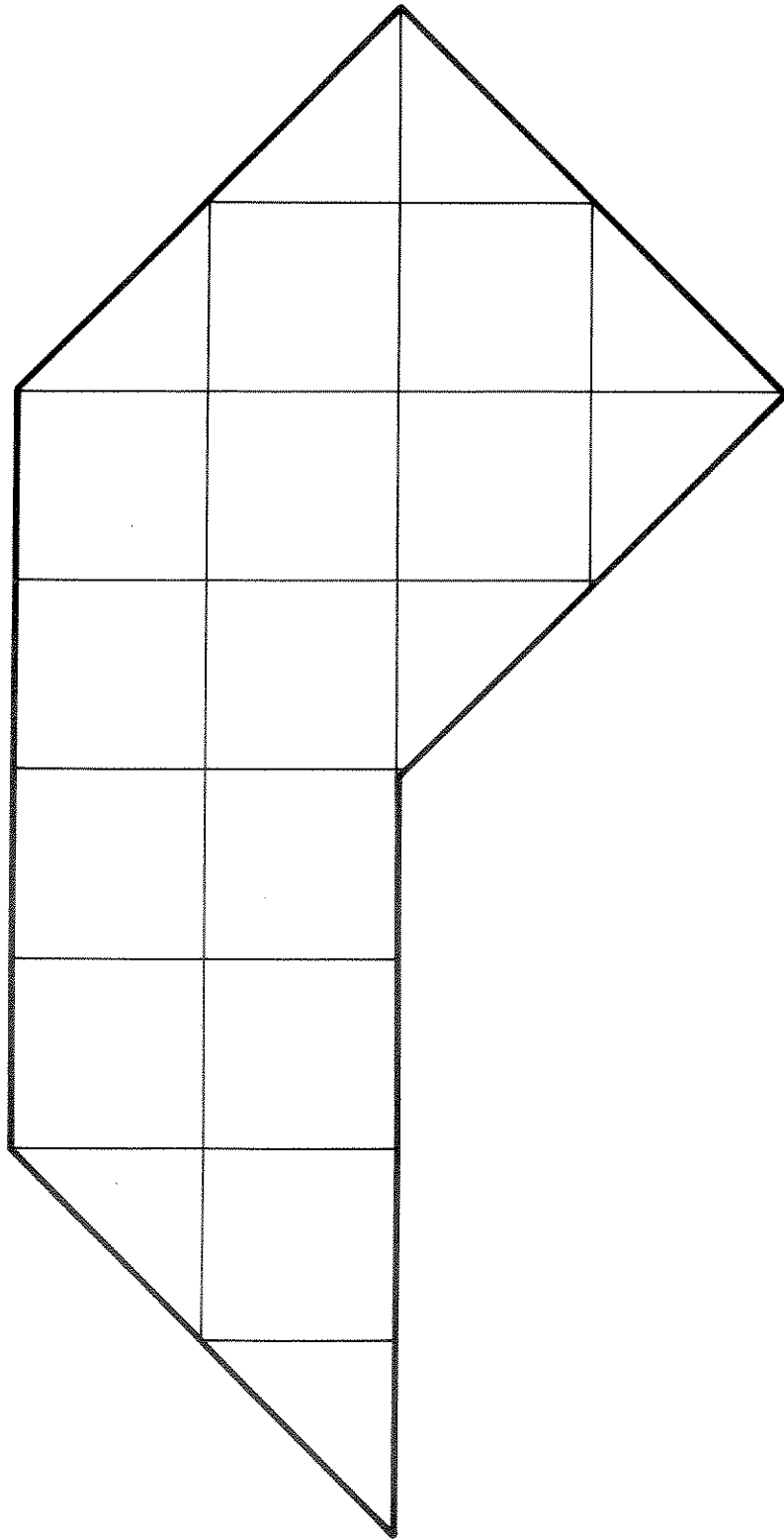


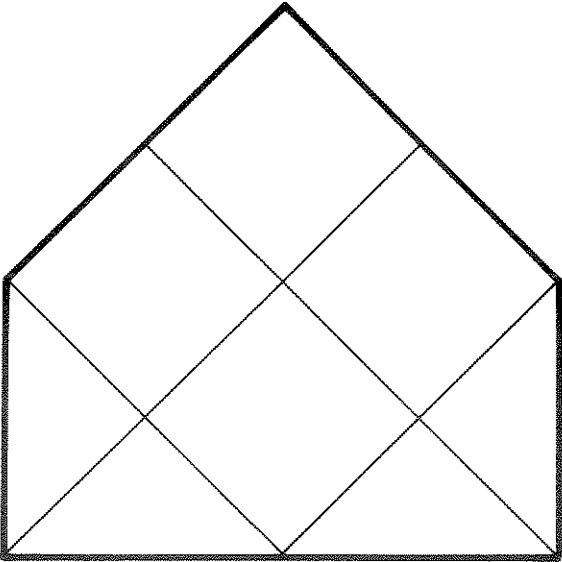


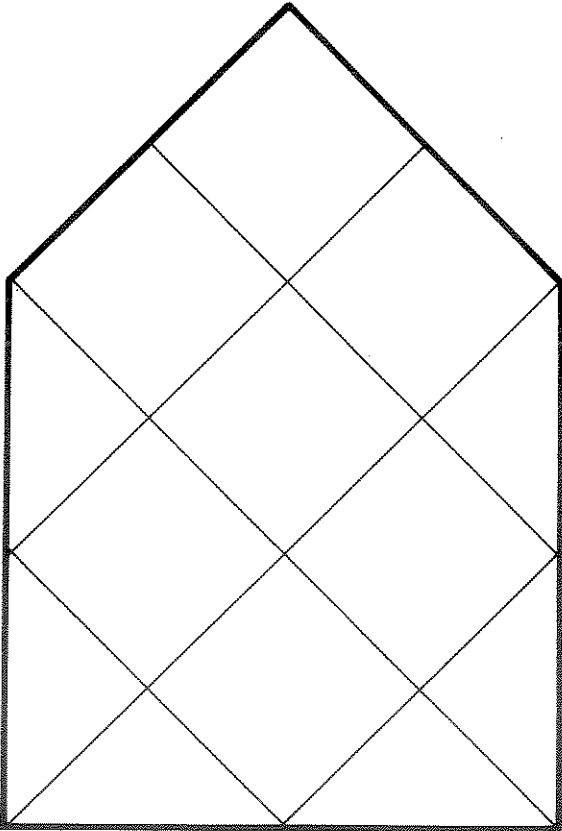


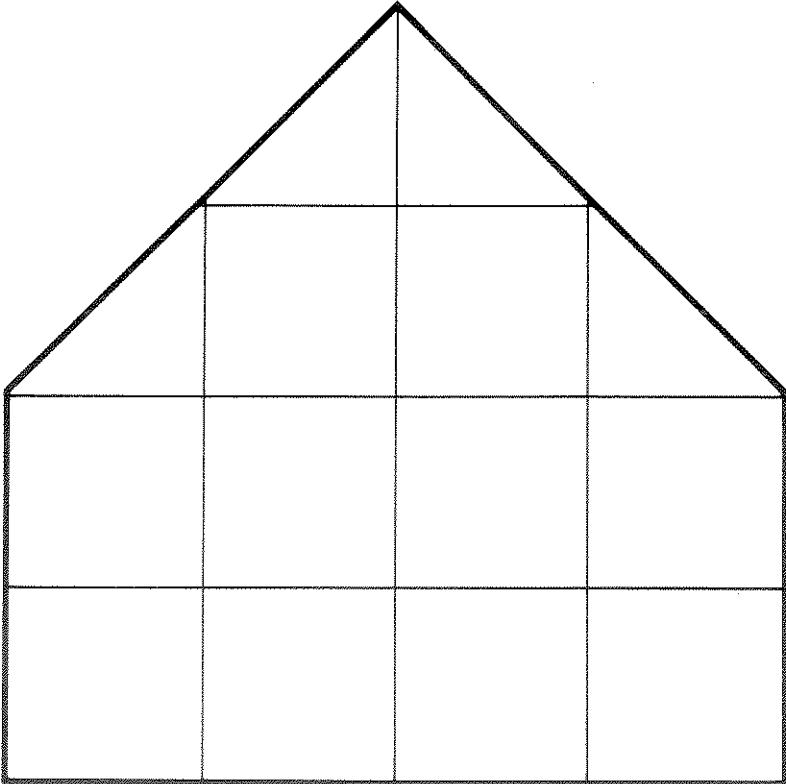


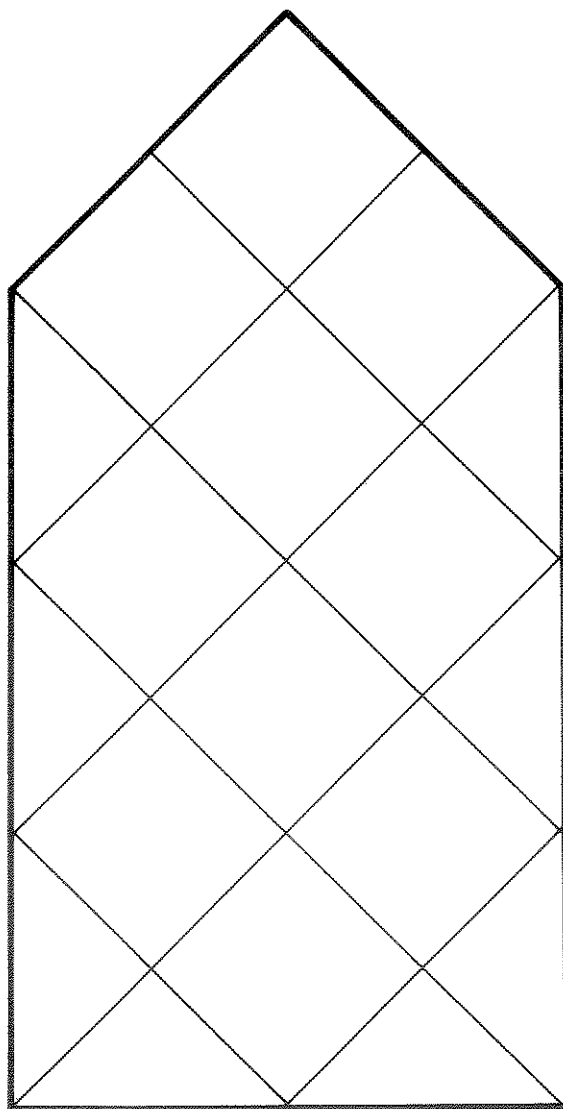


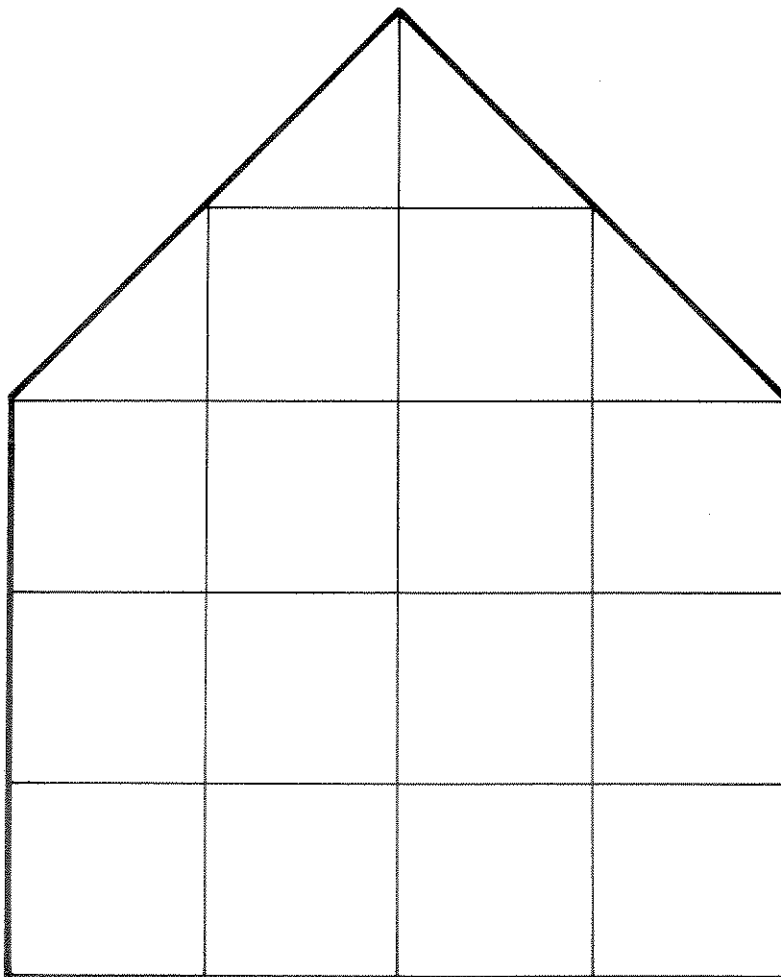


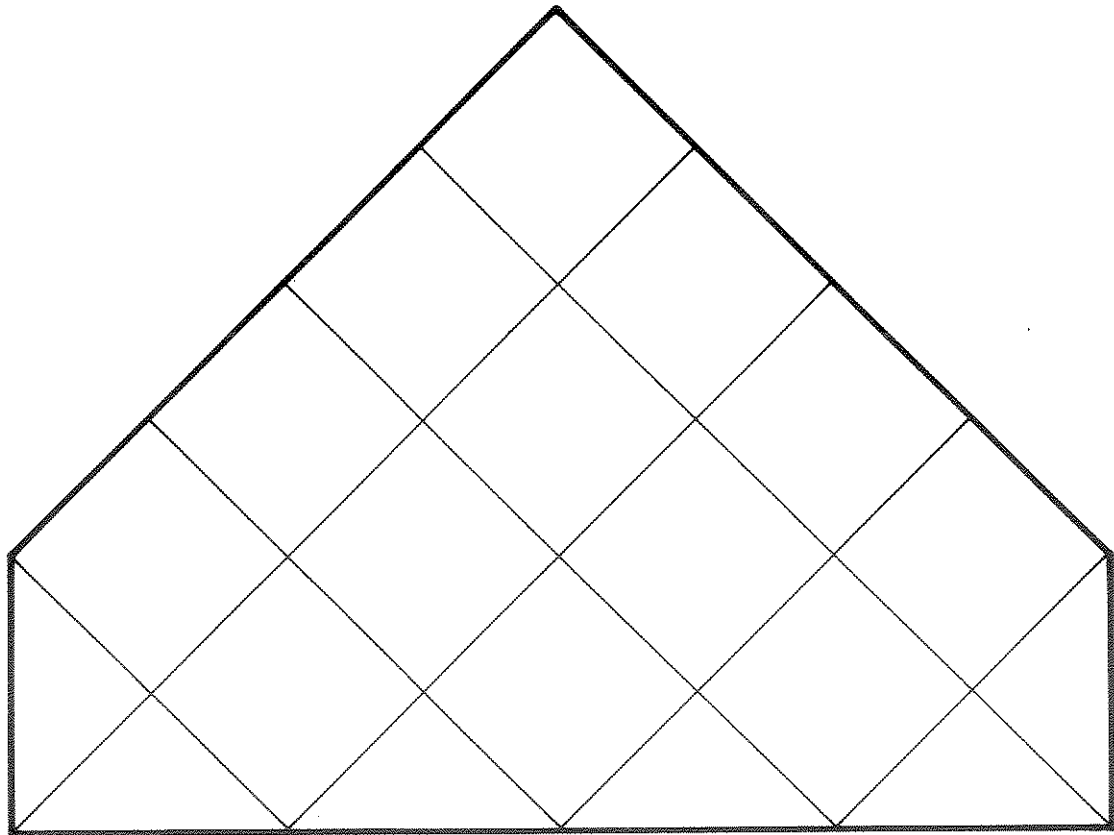


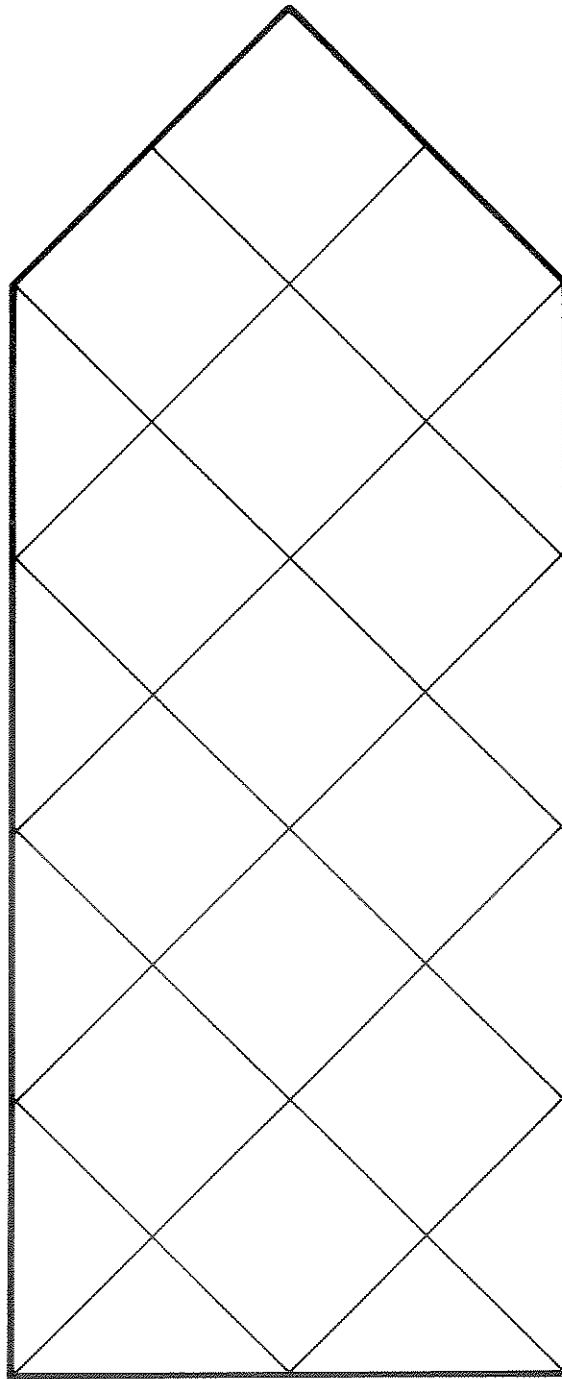




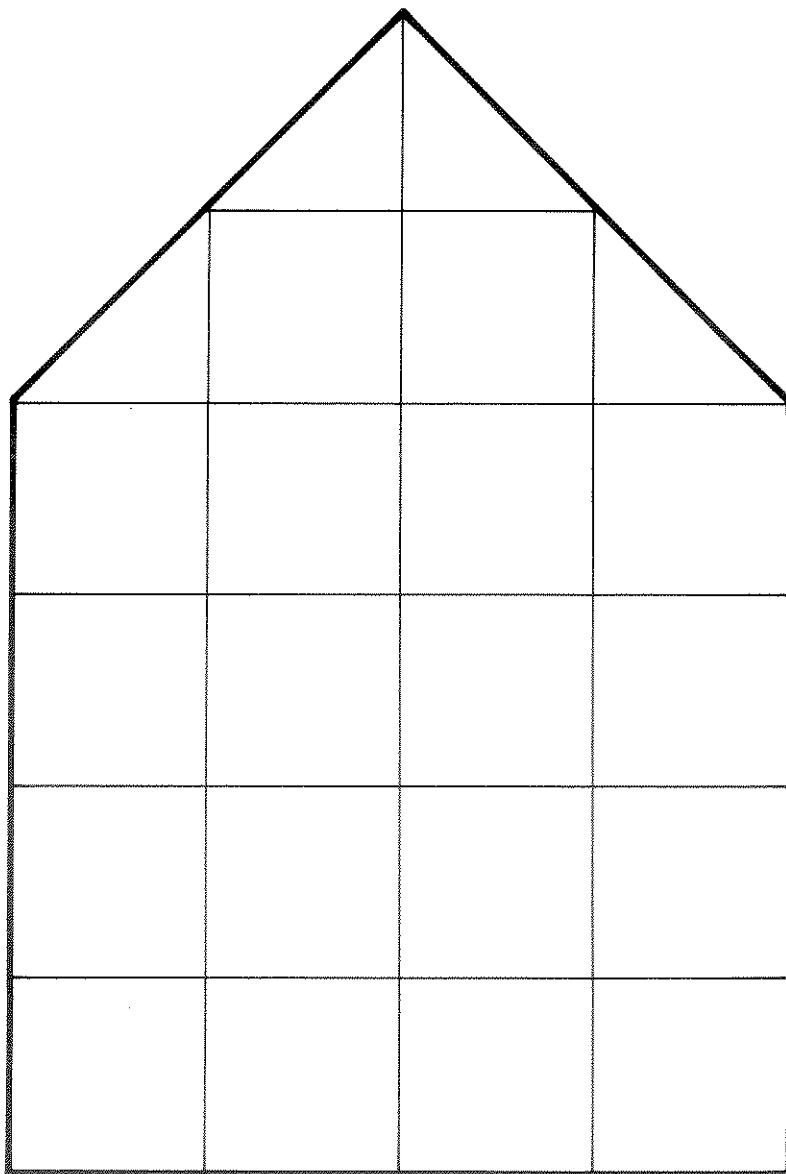


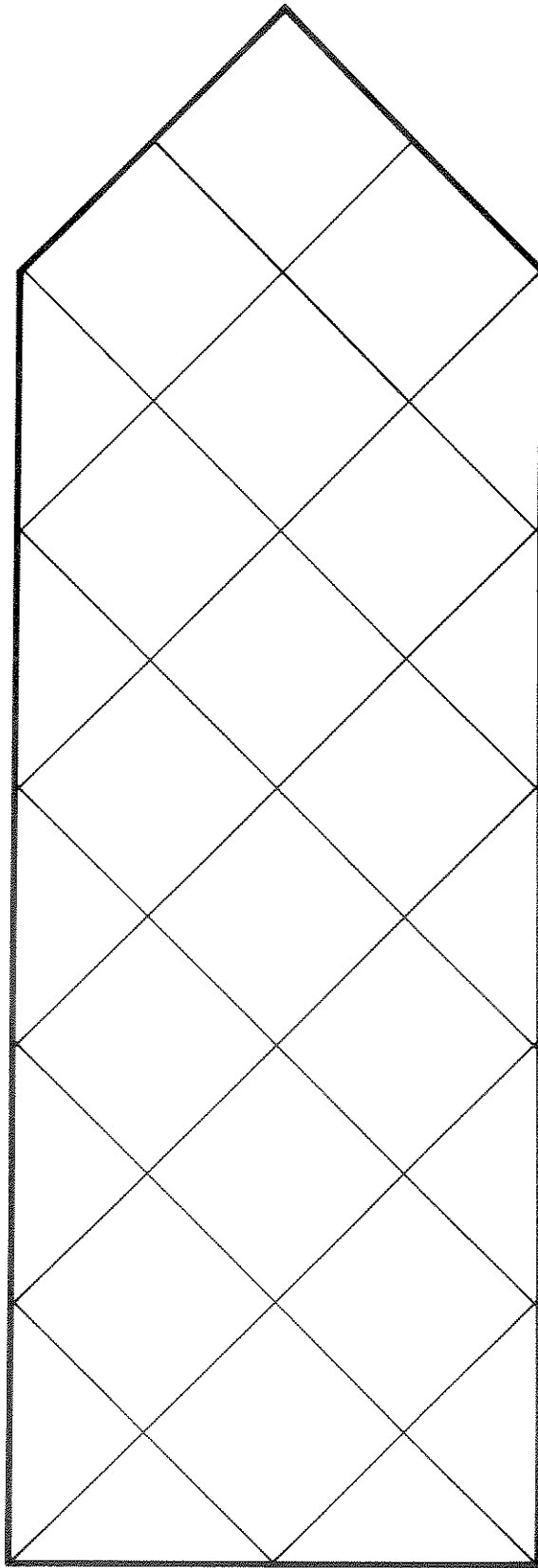


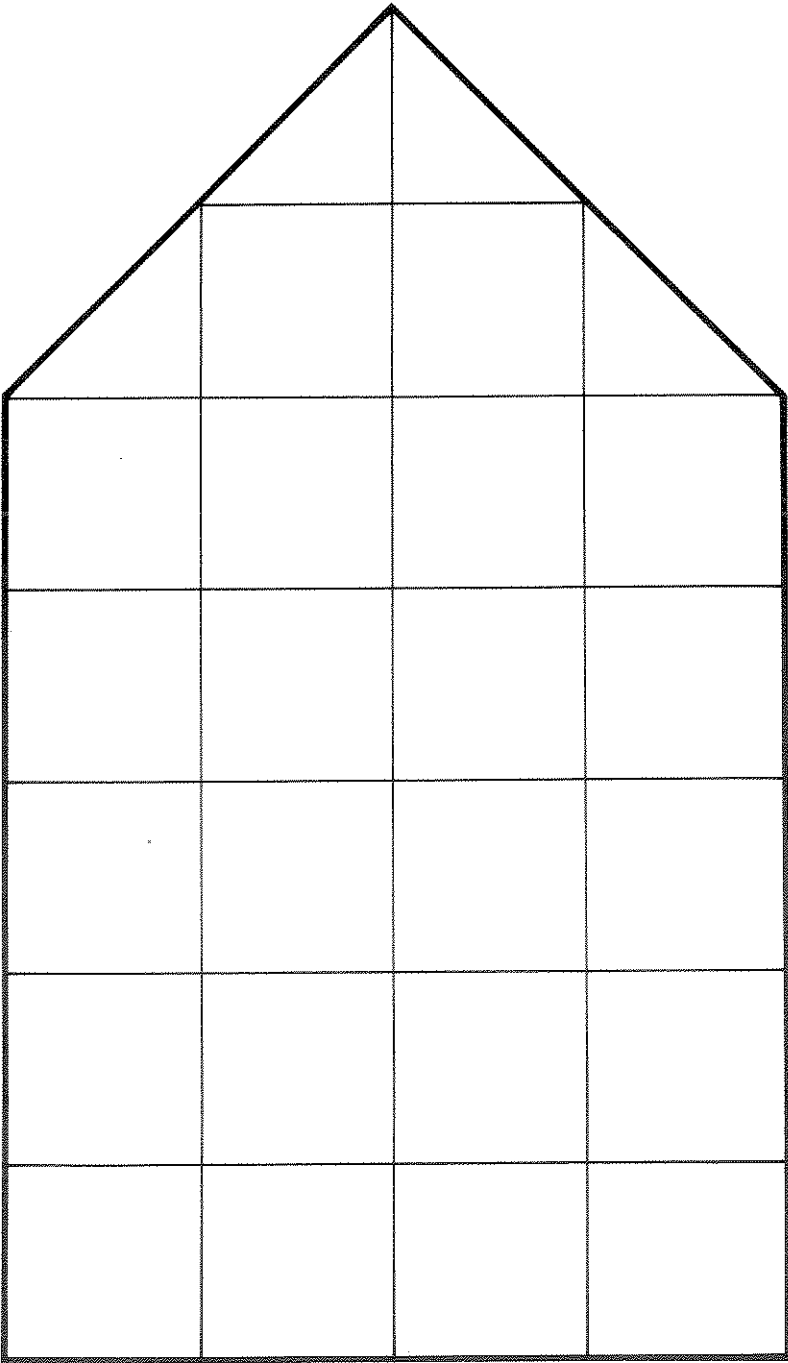


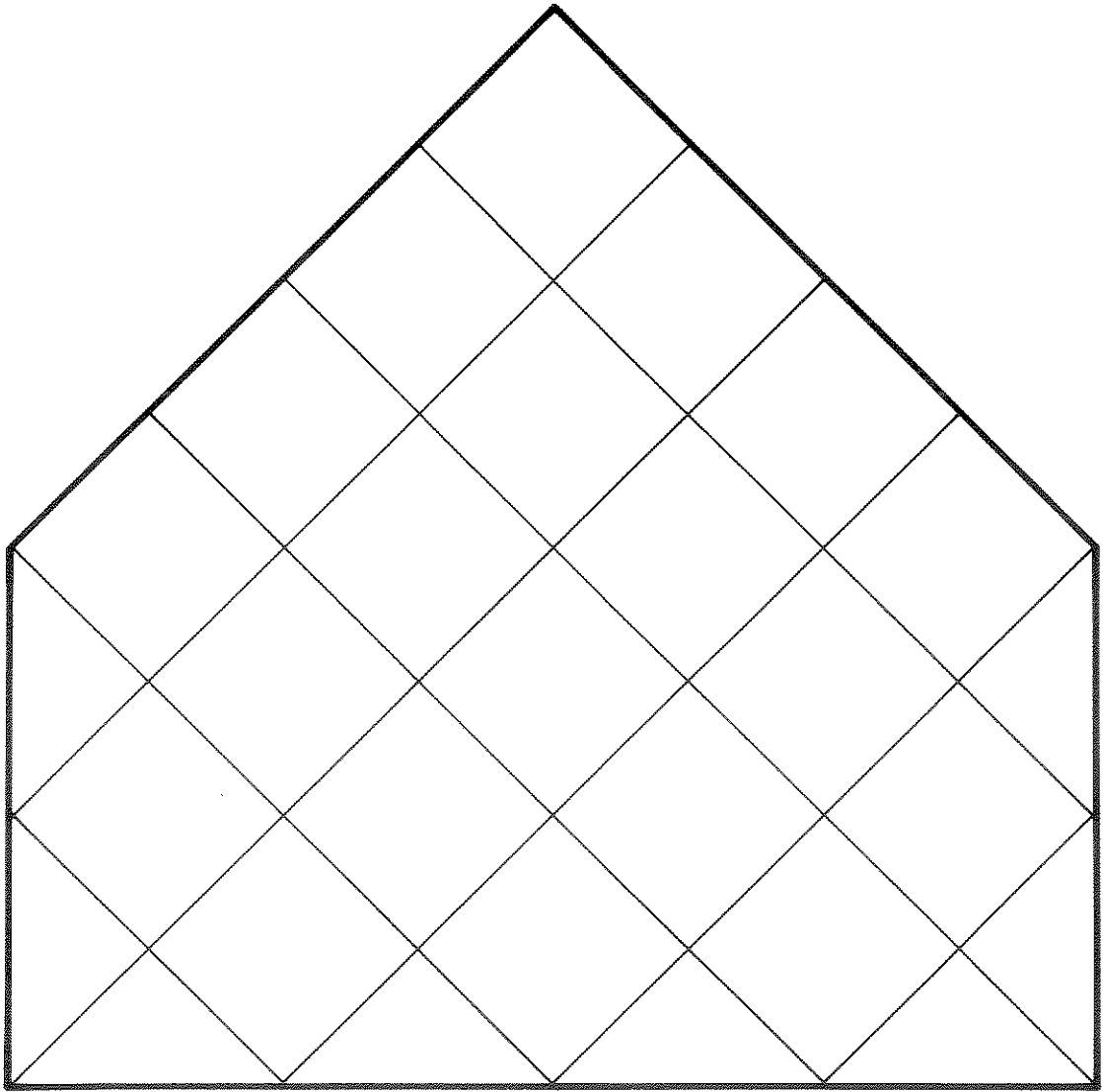


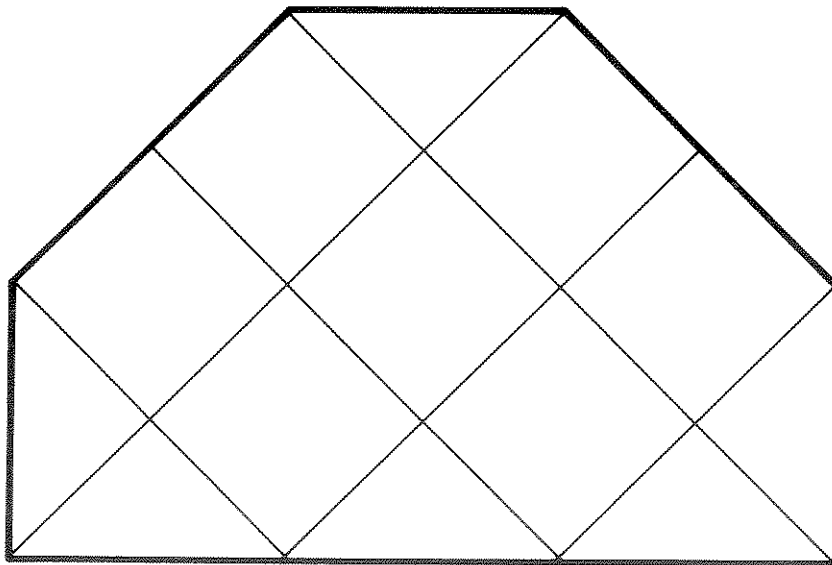
Cover with SuperTangrams™

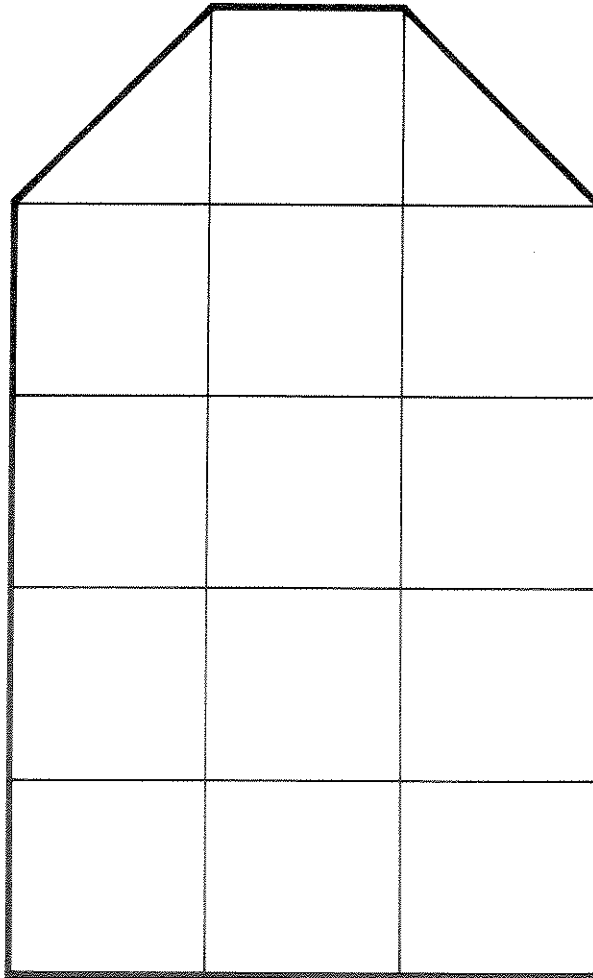


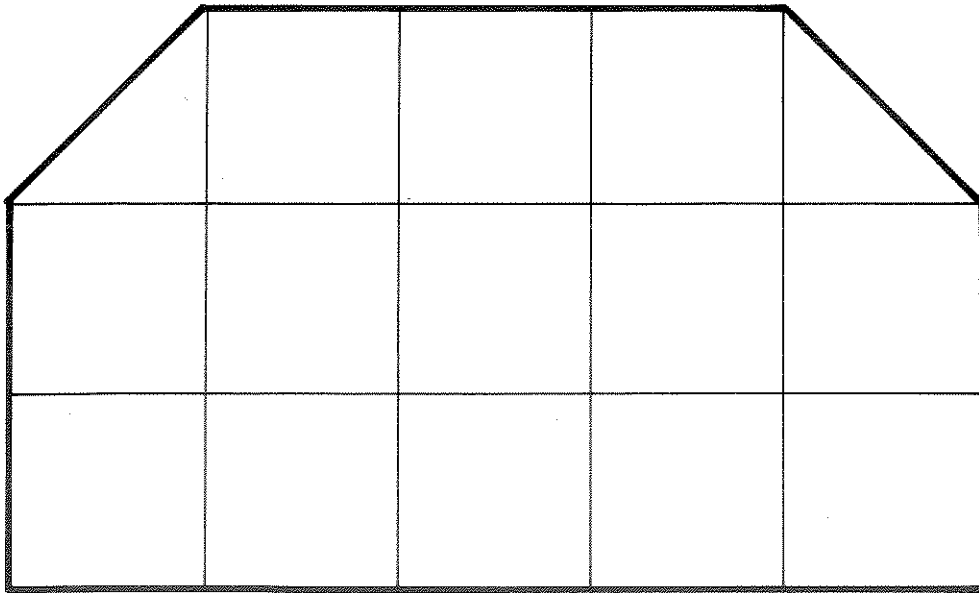


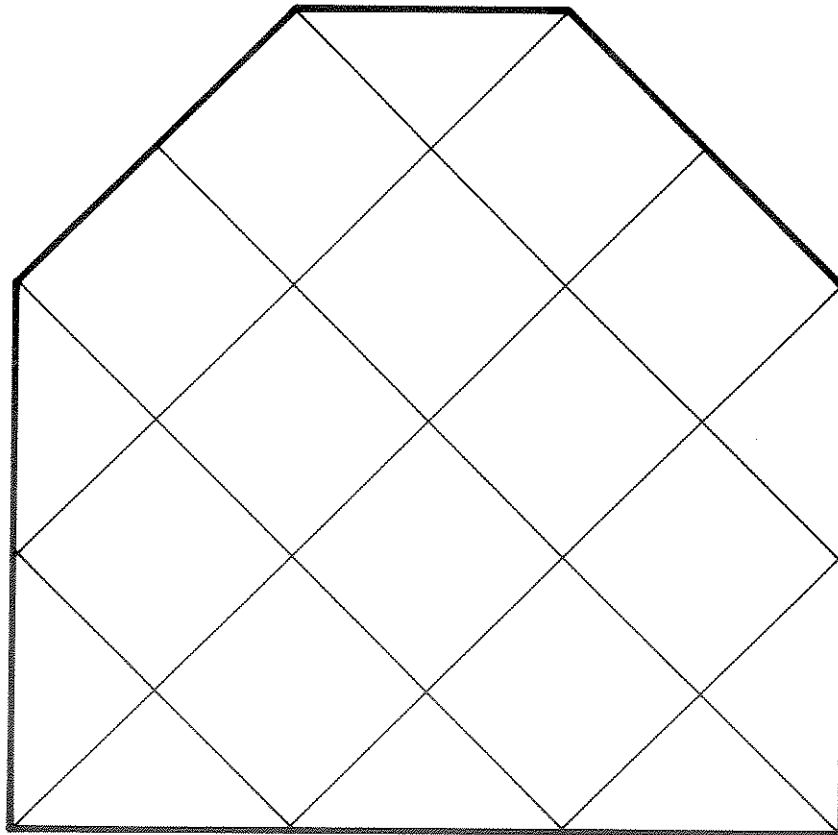


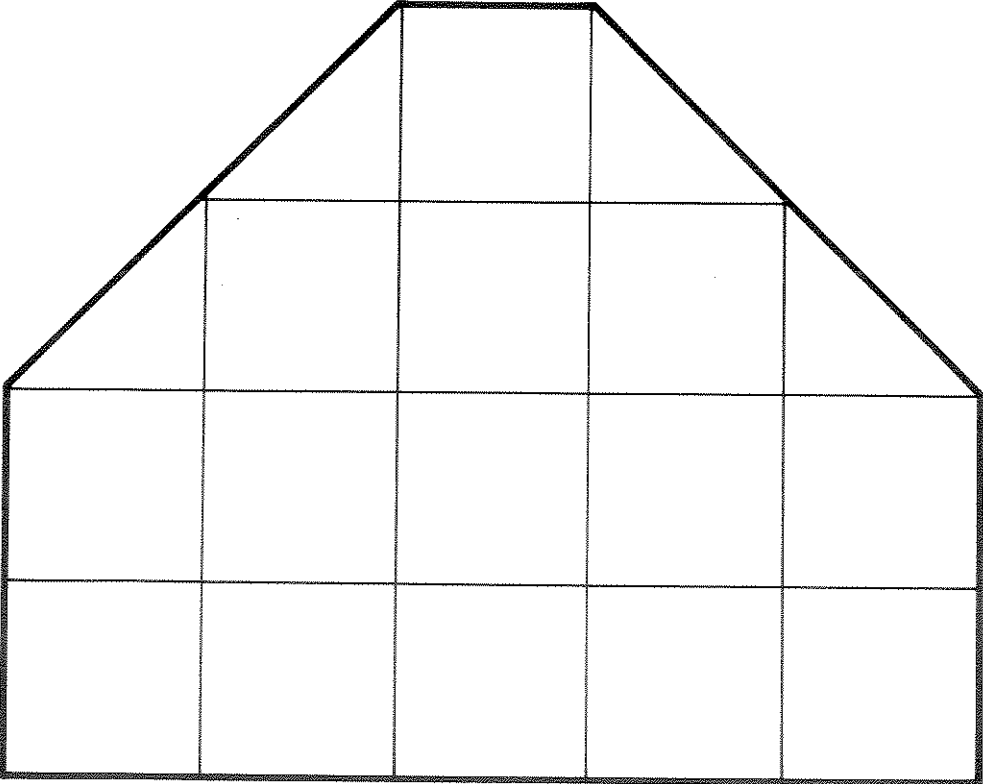


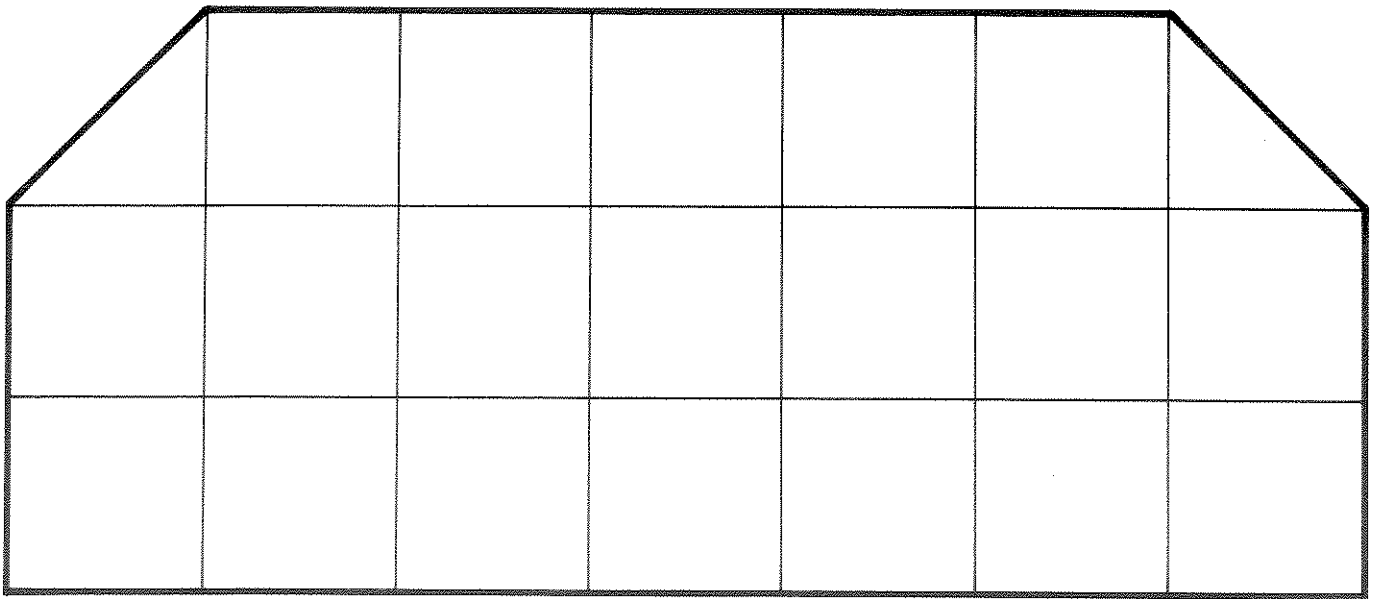




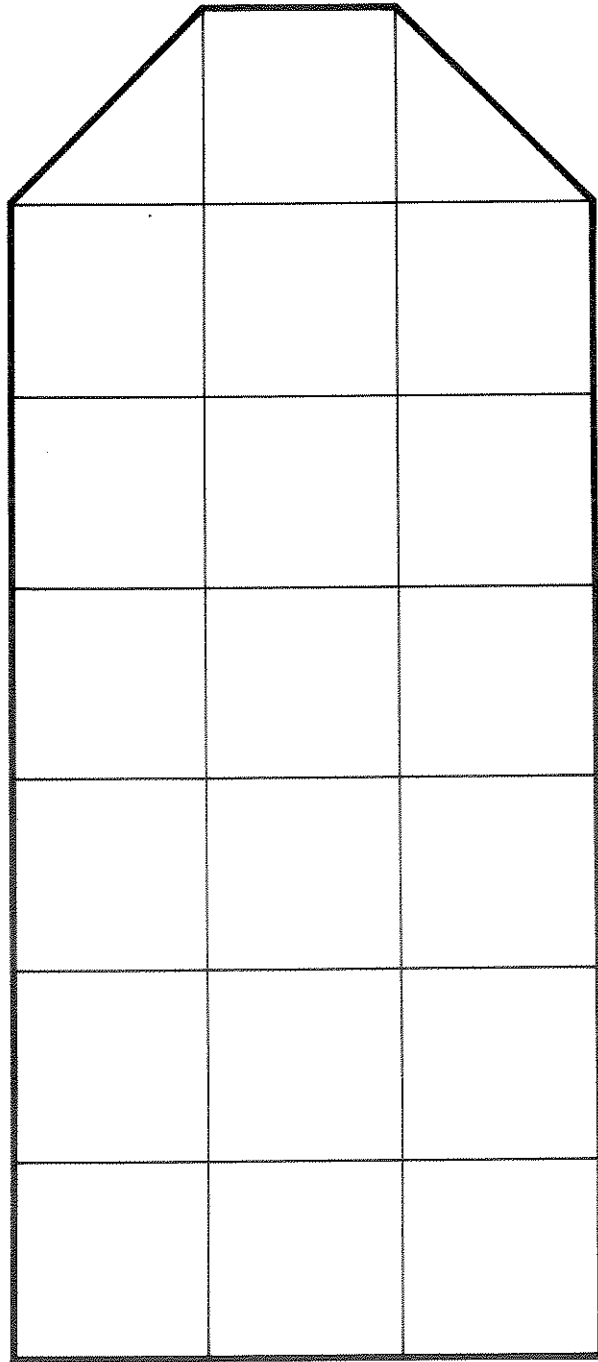


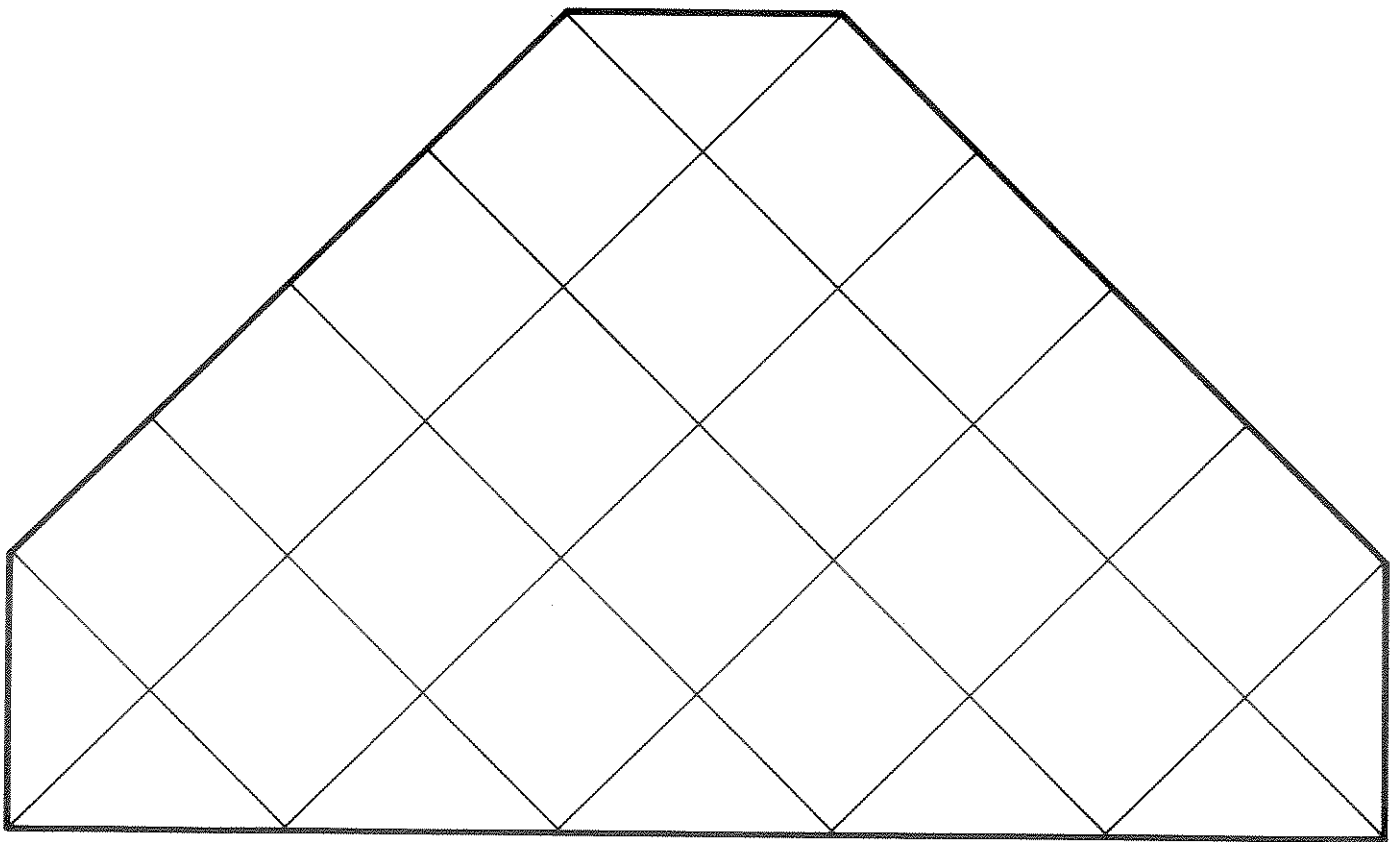




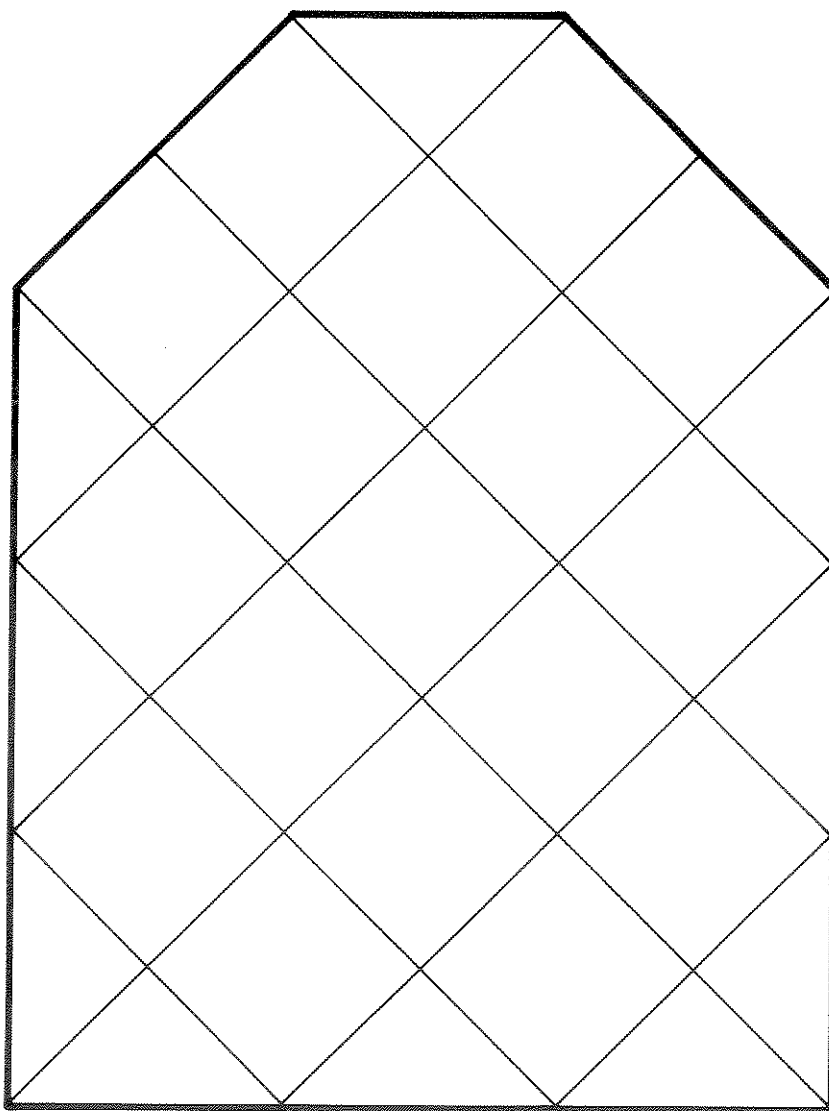


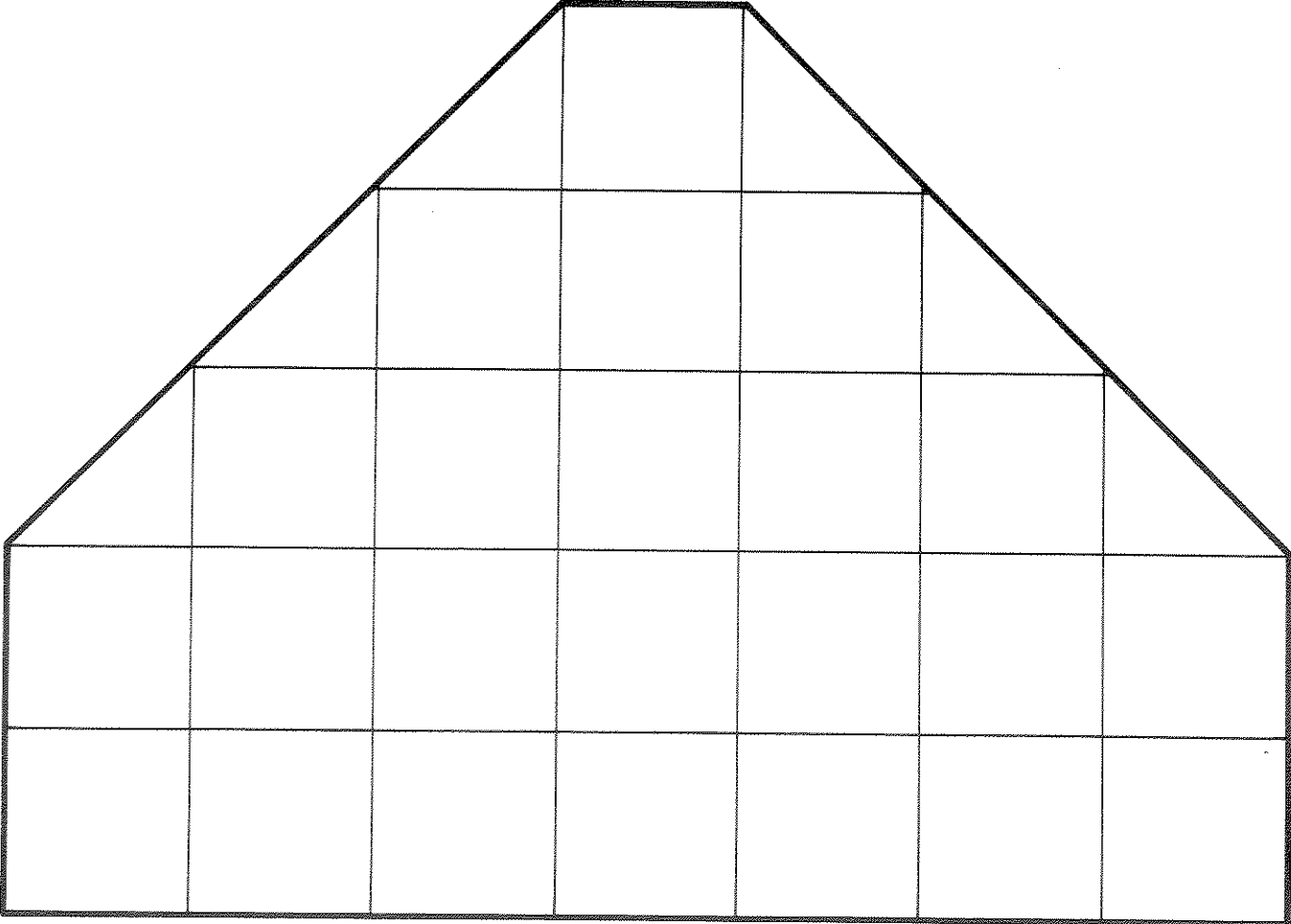
Cover with SuperTangrams™



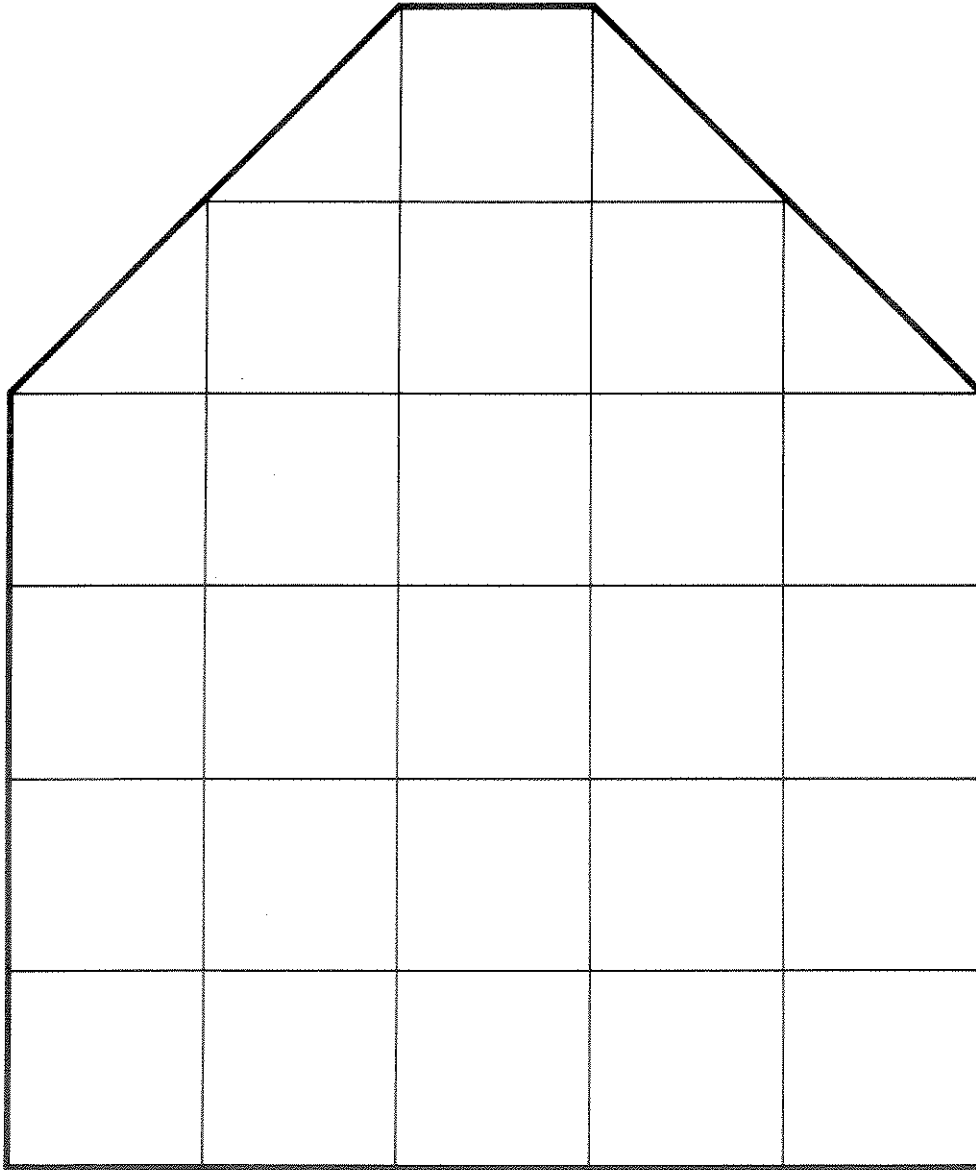


Cover with SuperTangrams™

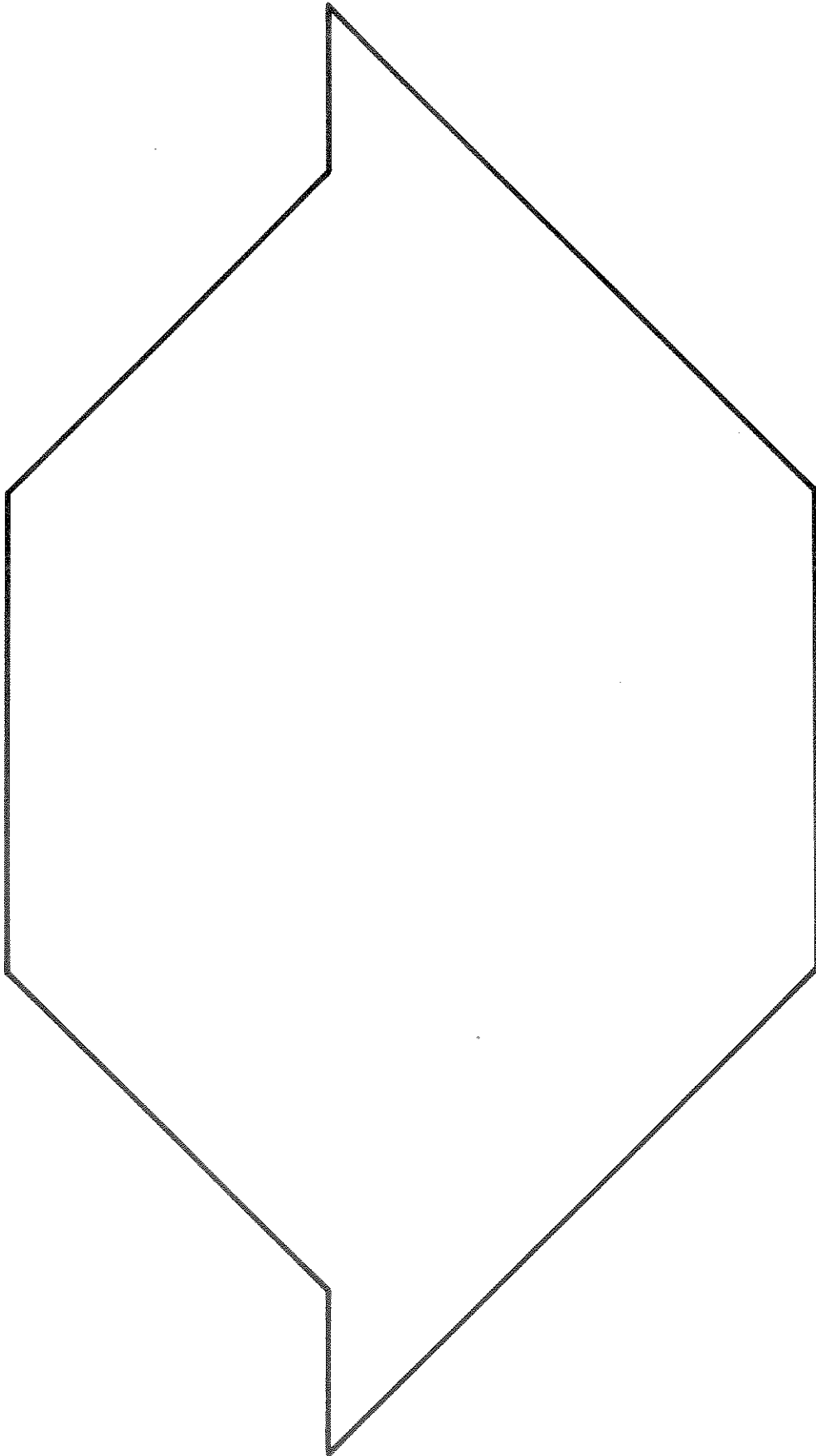




Cover with SuperTangrams™



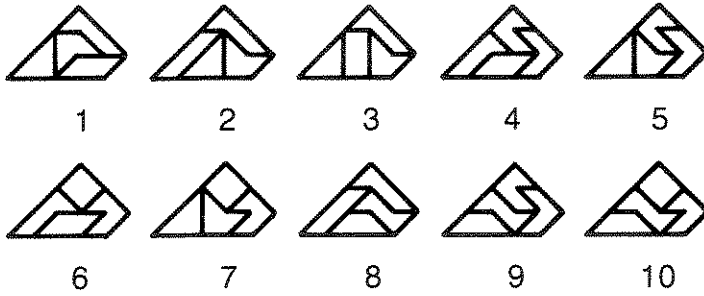
Cover this figure. Use all 14 SuperTangrams™



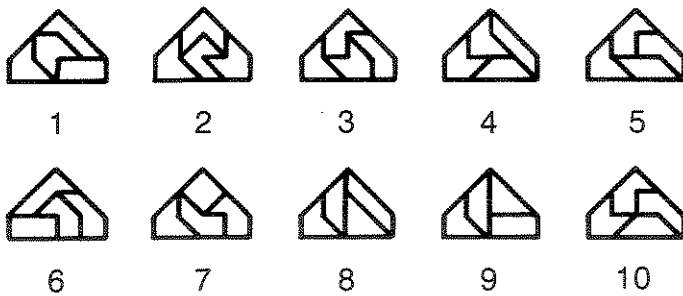
SOLUTIONS

Although only one solution is shown for each puzzle, there are several different solutions for many of them.

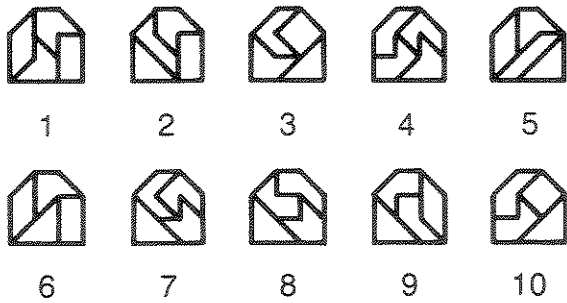
Set A Page 5



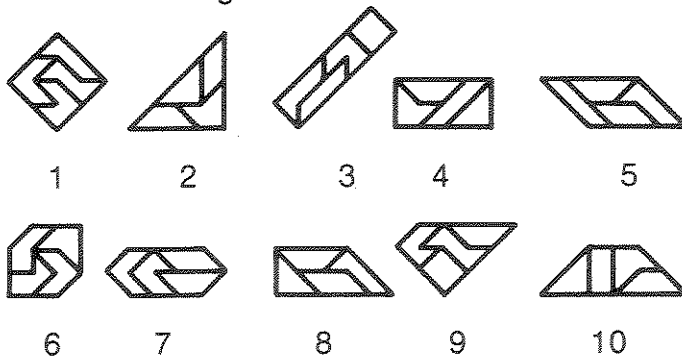
Set B Page 6



Set C Page 7

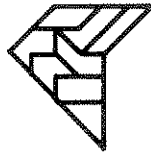


Set D Page 8

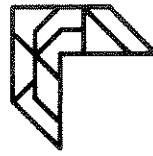




Page 10



Page 11



Page 12



Page 13



Page 14

Set E



Page 15



Page 16

Set F



Page 17



Page 18



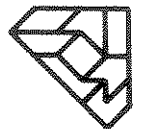
Page 19



Page 20



Page 21



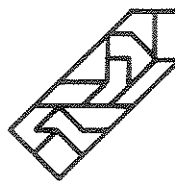
Page 22



Page 23



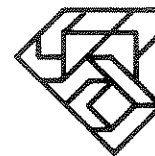
Page 24



Page 25



Page 26



Page 27

Set G



Page 28



Page 29



Page 30



Page 31



Page 32



Page 33



Page 34



Page 35



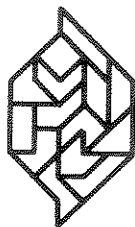
Page 36



Page 37



Page 38



Page 39