vertical, horizontal... and sewn together to form a quilt top. How many straight cuts and straight seams are required both for this method and the traditional method (cutting and sewing individual squares)?

The next time you look at a quilt, take a step back and consider how this quilt was constructed. Perhaps you can identify the basic block of the quilt, other ways that block could be arranged, or the most efficient way to construct the quilt.

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• *America's Heritage Quilts*. Better Homes and Gardens. Edited by Patricia Wilens. Meredith Corporation, Des Moines, IA. 1991

• *The Complete Book of Quiltmaking*. Michele Walker. Alfred A. Knopf, New York, NY. 1990.

•*Curriculum and Evaluation Standards for School Mathematics*, NCTM, Reston, VA. 1989.

"Mod 4 Quilts"

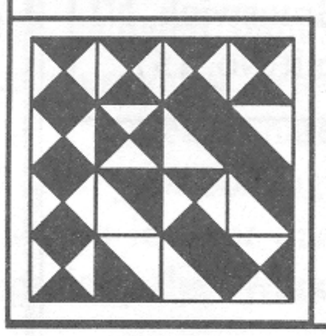
When one uses a mathematical rule to aid in the design of a quilt, there frequently arise some very pleasant patterns and symmetries. For example, consider the multiplication tables below: The first one is familiar, but the second one is created by replacing each entry with its remainder when divided by 4. For example, when 6 is divided by 4, the remainder is 2, so the sixes become twos in the new table. (This is called *multiplication mod 4*, by the way.) Now we refer to the basic quilt squares shown up top. Substituting them into the multiplication table shown to the right we obtain the quilt block labeled "A" below. You may wish to do the same thing with addition instead of multiplication. Why not take a minute and try it now. You should get the pattern labeled "B". In the next section, we will take advantage of the symmetry in these patterns.

0 1 2 3

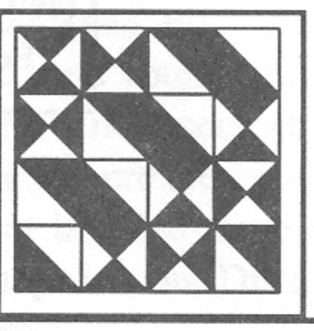
×	0	1	2	3
0	0	0	0	0
1	0	1	2	3
2	0	2	4	6
3	0	3	6	9

×	0	1	2	3
0	0	0	0	0
1	0	1	2	3
2	0	2	0	2
3	0	3	2	1

A

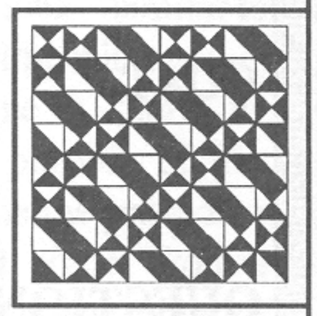


B



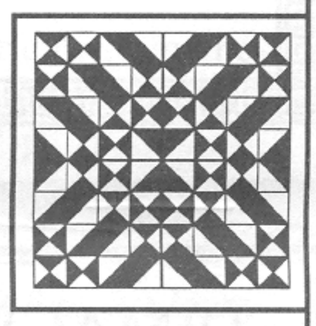
Build the quilt

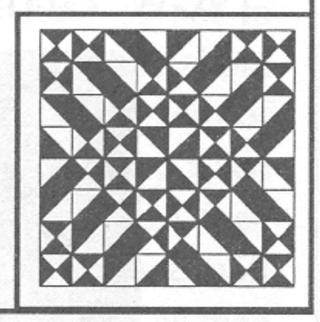
We can now sew together many copies of pattern B to generate a quilt. Can you tell which of the quilts on the right were generated by rotations, reflections and mere translations of pattern B?



Some questions

There are many questions which can be asked about the various stages of the quilt-building process. For example, young children can be asked to design symmetric tiles like 0, 1, 2 and 3 above. Or, given pictures of the tiles, they can be asked to find them in the finished quilt, and to tell whether they are in their original position, or have been rotated or reflected. Older children can be asked to find the number of ways to arrange the given tiles into a grid of squares. For this exercise, you might give a set of 2 tiles (instead of 4) and a 2×2 grid (instead of 4×4), and have them find them by systematic listing. Or, more advanced students can use the multiplication rule on these examples, or using 3, 5, or 6 tiles. There are many good discrete questions; the possible directions are limited by the teacher's imagination alone.





Leadership Program in Discrete Mathematics
Crash Course for High School Teachers

The Rutgers Leadership Program in Discrete Mathematics will be offering a 2-day "crash course" for high school teachers at Rutgers University on June 23-24, 1997. The content will include paths and circuits in graphs, sequences, voting methods, codes, and fractals. Meals will be provided, as well as lodging on the night of the 23rd. Persons interested in this program should contact Bonnie Katz at 908-445-4065, e-mail her at `bonnie@dimacs.rutgers.edu`, or write to Leadership Program, P.O. Box 10867, New Brunswick NJ 08906. This program is sponsored by the Center for Discrete Mathematics and Theoretical Computer Science (DIMACS) with funding by the National Science Foundation (NSF).