COMMENTS FOR THE TEACHER

Finding the Polyominoes, page 3

If possible, this whole chapter should be taught before showing any plastic polyominoes to the students.

You may use this opportunity to discuss the prefixes di-, tri-, tetr-, pent-, hex-, and hept-. They will be used many times in this book.

In addition to using grid paper to look for the pentominoes, your students can use orange pattern blocks (squares), geo-boards, one-inch cubes, or interlocking cubes. However, remind students to seek only the "flat" combinations.

Polyomino Names, page 6

Your students may want to make up their own names for the polyominoes. However, they will need to know the names used in this book.

Making Polyomino Rectangles, page 8

Students can solve these puzzles directly on quarter-inch grid paper, using a pencil and good eraser. It would be easier to work on one-inch grid paper, using cardboard polyominoes made from the patterns in the back of this book.

Pentomino Family Relationships, page 11

You might use this opportunity to discuss the meanings, in real life, of such obscure ideas as "second cousin once removed," etc.

Envelopes, page 12

This section is actually a guided hunt for the hexominoes. If you wish, you can let your students look for the hexominoes with no guidance, just by using the page titled *Hexominoes*. However, the systematic approach helps settle these uncertainties: Have we found them all? Are there any duplicates? These questions are easier to answer when the hexominoes are classified by envelopes.

Many pentomino puzzles and problems can be adapted for the hexominoes.

Minimum Covers, page 17

It is not necessary for your students to find the covers shown in the solutions. Let them find what they can, then try to beat that record.

Tiling, page 18

Instead of working on grid paper, your students could work on oversized unlined paper and trace plastic polyominoes repeatedly.

Encourage students to color their tilings of the plane for a bulletin board display of the most spectacular drawings.

Rep-tiles, page 30

You and your students may investigate other shapes to see if they are rep-tiles. For example, all but one of the pattern blocks are rep-tiles.

Perimeter 10, page 34

Your students may work right on this puzzle page with pencil and eraser. However, it is easier to work on one-inch grid paper, with pieces made from the patterns in the back of this book.

You may find all shapes that have a perimeter of 12 (there are 25) and create puzzles for them.

Perimeter and Area Table, page 35

Some students find it hard to accept that it is impossible to have a polyomino with an odd-numbered perimeter. The reason it is impossible is that each side, or part of a side, of a polyomino can be matched with another side, or part of a side. It has an "opposite." Therefore, the perimeter must be an even number.

The pattern for the maximum perimeter becomes evident after a time. Try to get students to verbalize it. If they are mathematically mature, see if they can create a formula.

The pattern for the minimum perimeter is much harder to see. One way to state it is that it remains constant for the sequences of one, one, two, two, three, three, etc. consecutive values of the area. Then it increases by two.

Perimeter-Area Predictions, page 36

This is the beginning of the most quantitative part of the book so far. It is best suited to eighth-grade students or gifted students in the lower grades. You may want just to skip the rest of this chapter.

Perimeter-Area Graphing, page 37

You might have students graph not only maximum and minimum perimeters, but all possible perimeters. They would then fill up the entire space between minimum and maximum perimeter, though only on even, whole number values of the perimeter.

Perimeter-Area Formulas, page 39

Notice that the perimeter cannot be odd since it is obtained by doubling a number. The lowest perimeter can be found from the area like this: It is the smallest even number greater than four times the square root of the area.

One-Sided Polyominoes, page 40

Many problems and puzzles involving ordinary polyominoes can be investigated for one-sided polyominoes.

Polyrectangles, page 41

These shapes are closely related to the polyominoes. Each polyomino yields a "wide" and a "tall" version of itself among the polyrectangles, except for those that are symmetrical around a diagonal line (the square tetromino, the V, W, and X pentominoes). They yield only one polyrectangle each.

Polytans, page 42

Use this opportunity to introduce tangram and Supertangram™ puzzles.