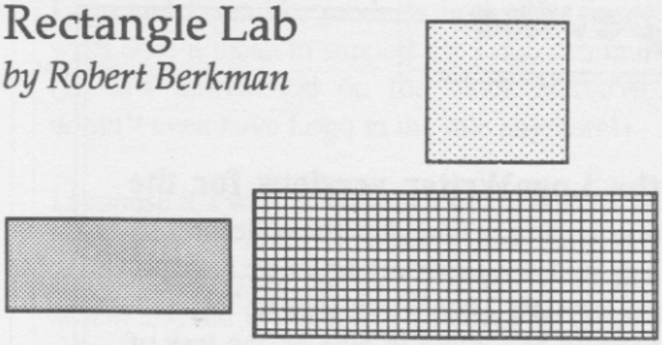
Rectangle Lab

by Robert Berkman

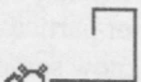


Creating perfect software is often seen as a similar process to creating the perfect bouillabaisse: lots of time, lots of fancy ingredients (read: fancy programming), and salt and pepper to correct the seasoning (debugging). Presto! Another great program has come to life. However, I find that even the simplest programs can convey powerful ideas, and these powerful ideas can lead students (and their teachers) to discover new mathematical truths that heretofore seemed "self-evident."

Here is a 2 line program (okay, 4 lines including the "to" and "end" statements) which is practically guaranteed to give your students new insights into the nature of rectangles. I have used this program with students in grades 5-7 with equally good results.

```
TO RECT :L :W :L2 :W2
RG HT PU SETPOS [-50 -50] SETH 0 PD
FD :L * 14 RT 90 FD :W * 14 RT 90 FD :L2 * 14
RT 90 FD :W2 * 14
END
```

Example: RECT 1 2 3 4 (Press Return)



You might want to fine tune the "constant" (as in :L * 14) which is set to 14 turtle steps. I use this so that the lines will all be in centimeters. Check the calibration. Monitor sizes vary and you may have to add or subtract to get the measurements to be in centimeters. This is important in the second part of the lesson.

The first activity is a puzzle which is designed to introduce students to the RECT command. I ask them to type in about 5 different RECT commands, and they must then predict which ones will make perfect rectangles.

So what's the point? For one, it reminds students of what we take to be obvious: rectangles have 4 right angles with opposite sides equal. You can build a 2-3-2-3 rectangle, but not a 3-2-2-3 rectangle, even though the lengths of the sides are the same. In addition, students will make use of higher order thinking skills to decode the computer's construction rules.

Perimeters and Areas

The next step is to get students into calculating area and perimeter. I usually prep them for this by using a "geoboard" (a wooden board with 5 by 5 rows and columns of nails) for the previous 2-3 days to explain the concepts of perimeter and area. I then have the students make centimeter rulers out of paper and measure the lengths of the rectangles' sides right off the monitor. With this information they can calculate the perimeter and area of each figure.

The first thing I do is give them the following rectangles to measure: RECT 2 4 2 4, RECT 1 5 1 5, RECT 3 3 3 3 and RECT 4 2 4 2. As the students keep track of their calculations, hopefully they'll notice that each of these rectangles has the same perimeter, but different areas.

If they do that, I ask them to try to find some of their own. For example, I might ask them to find out how many rectangles with different areas they can make with a perimeter of 7. From there, I can then ask

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