Patterns: A Guessing Game

Introduction

This is a discover-the-pattern game based on the game of Eleusis, invented by Sid Sackson. I have used it for many years on the first day of class in the so-called liberal arts math class, and recently also in a math for elementary teachers class, and in an algebra class which was linked to an intercultural communications course. It shows students that they must first make mistakes in order to make discoveries, and encourages them to generalize and discuss what they see. It can also be used to discuss modular or "clock arithmetic," if that is part of the curriculum. The students should also be given a chance to invent their own patterns.

(1) Draw this box on the board, labeling the rows and columns 0 through 5, and also draw and label the circle, square, star and dot beside the square, as shown. Write your name and the word class near the square for scorekeeping.

Circle ●
Square ■
Star ✳
Dot •

Teacher   Class

Do not let the students see this pattern, which they are to guess, little by little.

(2) Have the students take turns guessing which symbol is in a box. They should name the box by giving two numbers, the first for the column, and the second for the row. Place a mark indicating a point under the word class if the guess is correct, otherwise the point goes to the teacher. For example, if the student says, "I think that in box 1,2 there is a circle," then the teacher gets the point, because box (1,2) is actually a square. Draw in the square in box (1,2), whether the class got it correctly or not (incorrect guesses actually lead to information in this version of the game.)

Try not to call on the same student twice, at least until everyone has had a chance to make a guess. You may need to search out those who have not yet guessed. Little by little the students will figure out the pattern, and they will make fewer and fewer mistakes.

(3) After about 10 or 15 points total have been scored, ask "How many points does it take to win?" Keep asking for opinions along with explanations until the class is satisfied someone has gotten it right and can convince the others. (There are 36 boxes, so it takes one more than half, or 19, to win.)

(4) After the class has reached 19 points (I rarely win the game), the game will go more quickly. You might have the class vote on the last few. Ask for an explanation of the patterns

that they see. Remember, there is no "correct" way to describe these patterns, so continue asking for patterns until the class has come up with a number of them.

(5) Draw a few additional rows and columns around the finished pattern on the board, and ask how the pattern should be extended to those boxes:


(6) These are not easy questions.
Ask what goes in box (100, 150)? In box (100,151)?
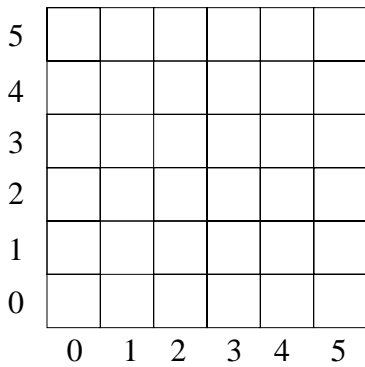In box (—5,—10)?

The students may try to find patterns in the diagonals, and such patterns do exist, but these patterns are difficult to extend. The patterns they see in the rows and columns may be easier for them. For example, the even numbered columns are all identical, cycling the dot, circle and star repeatedly as you move up those columns. The odd numbered columns are also identical, with a different arrangement of circle, star, and square repeating endlessly.

The rows also repeat, but here there are three different repeating patterns. Every third row is identical. For example, rows 0, 3, and 6 are the same. Also rows 1, 4, and 7 are the same. Row 150 should be the same as row 0, since 150 is divisible by three, and column 100 should be the same as column 0, since 100 is an even number. So box (100,150) should have a dot, just like (0,0), (0,3), (2,0), and (2,3).

(7) Show the students that the overall pattern could be thought of as repeating this little 2 by 3 box of symbols endlessly, as if they were a rubber stamp used to stamp out the pattern. This incorporates the idea about the columns repeating every second time, the rows repeating every third time. It also leads into the next handout about repeating patterns.
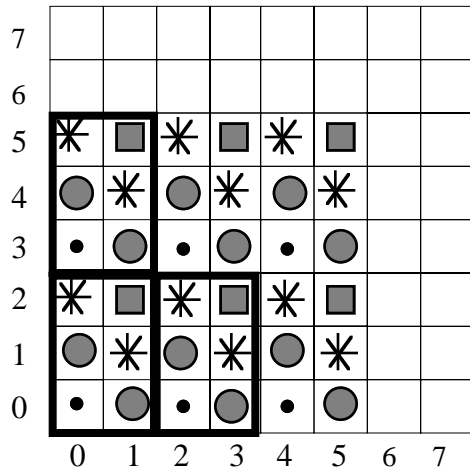
(8) Have the students create their own patterns. You can use the diagrams below as a template for handouts. You might divide them into groups and have them play the game in their group, or you might choose one of the students who has created an interesting pattern to play the game against the class.

Create your own pattern puzzle