This month, challenge your students to explore a version of the classic table-seating problem.

Problem scenario
Your school is building a new small cafeteria that will seat about one class at a time. The principal announced a contest for the best design of how the seating should be arranged, and all students in your school may submit one design. The cafeteria staff has outlined a few guidelines for each submission (see the activity sheet on p. 394, which also has five questions for students to explore).

Classroom setup
This task is best suited for upper elementary school children (grades 3–5). When you present this scenario, make sure that your students understand what is being asked; then provide an opportunity for them to explore the task in small groups or on their own. Give them graph paper to use in developing their designs. While students work, support them by asking such questions as the following:

- **What** is the problem asking?
- **Is** there some information in the problem that can help you get started?
- **What** model or diagram might we use to help us solve this problem?
- **Which** diagrams probably will not work based on the guidelines that the cafeteria staff gave?
- **Should** we start with a smaller seating capacity and add on?

After students have found answers, pose the following questions to further examine their mathematical thinking:
• What representations or seating design did you create to support your answer?
• Why did you choose this particular seating design over another one?
• What patterns did you find in the seating design that helped you solve this problem?
• Which designs did you eliminate as options that will not work in the cafeteria layout?
• What is the smallest number of card tables needed? How do you know?

As students work, encourage them to explain how they found their answers and how they created representations (e.g., tables) to support and justify their answers.

Share your students’ work
Try this problem with your students. We are interested in how they respond to the problem. Note what problem-solving strategies they use and how they explain or justify their reasoning. Send your thoughts and reflections—including information about how you posed the problem, samples of students’ work, and photographs showing your problem solvers in action—by May 15, 2011, to “problem solvers” department editor Denise T. Johnson, 241-E Anderson Center, 601 South Martin Luther King Jr. Drive, Winston-Salem, NC 27127; or e-mail her at the address below. Selections will be published in a subsequent issue of TCM and acknowledged by name, grade level, and school name unless you indicate otherwise.

Where’s the math?
This task uses the concepts of pattern and perimeter as well as the strategy of making a drawing or diagram. Middle-grades elementary students may need to be reminded about concepts of perimeter. Once students have developed several arrangements, it is important that they determine that a single row of tables works best to allow for more seating.

Show off your students!
Each month, the “problem solvers” department features a challenging mathematics problem for you to try with your students. Take notes as your students tackle the problem, and then share with us any insights you gain from observing their efforts. Department editors compile teacher reflections and student results, which appear in the “problem solvers: solutions” section of a subsequent issue of the journal.

Sharing your students’ work makes a valuable contribution to the journal, and it is fun to see your input in print. Details about how to contribute appear under the heading Share your students’ work in the “problem solvers: problem” section of each issue.

Additional resources
Visit www.nctm.org to copy text from the online version of the activity sheet on the next page. Paste it into your own document and modify it for your students.

Visit www.nctm.org/catalog/ for more NCTM resources, including professional development offerings, online resources, and other publications. NCTM has published a collection of past “problem solvers” columns:

The cafeteria contest

Your school is building a new small cafeteria that will seat about one class at a time. The principal announced a contest for the best design of how the seating should be arranged, and all students in your school may submit one design. The cafeteria staff has outlined a few guidelines for each submission:

- The design should provide seating for 32 people.
- Tables being purchased are in the shape of a square and can fit only one person on each side.
- Tables can be arranged end to end to make one large table.
- Tables should be aligned to fit inside the space allocated for seats in the cafeteria (shown on the grid to the left).

Sample table used by cafeteria

1. What is the smallest number of tables needed to seat 32 people?
   a. What representations did you create to support your answer?
   b. What patterns did you find that helped you solve this problem?

2. What seating arrangement design generates the fewest number of tables needed?

3. What is the smallest number of tables required to seat 42 people?