READER reflections

REDISTRICTING RESOURCES

Early birds who want to help their classes prepare for the 2020 redistricting of U.S. congressional districts may wish to consult the following free resources as supplements to "Decennial Redistricting: Rich Mathematics in Context," by Laurie H. Rubel, Michael Driskill, and Lawrence M. Lesser (*MT* Oct. 2012, vol. 106, no. 3, pp. 206–11).

As a former instructor of the mathematics of reapportionment, I highly recommend "A Mathematical Adventure through the Census, Reapportionment, and Redistricting" (Mathematical Association of America 2012). This is a forty-nine-minute video with slides, by Karen Saxe, professor of mathematics at Macalester College in Saint Paul, Minnesota, and a former member of a Minnesota redistricting commission. The video contains a mapping exercise as well as some nice history and information about other countries. It is available at http://www.maa.org/meetings/calendar-events/maa-distinguished-lecture-series/lecture-videos or http://www.youtube.com/watch?v=UDVC2L4d_1w&feature=youtu.be.

The MAA also has an online periodical, "A Political Redistricting Tool for the Rest of Us," with examples of unusual district designs, discussions of their mathematical aspects, and a redistricting applet, all available at http://www.maa.org/publications/periodicals/a-political-redistricting-tool-for-the-rest-of-us.

For more extensive hands-on exercises, see the USC Annenberg Center's "Redistricting Game," at http://redistrictinggame.org/. And for fun, see ProPublica's four-minute "Redistricting Song," at www.propublica.org/article/video-the-redistricting-song.

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DEFINE A VARIABLE—OR SIX

Re "A Random Walk: Stumbling across Connections," by Nicholas H. Wasserman (*MT* May 2015, vol. 108, no. 9, pp. 686–95): When I saw the subhead "Two Algebraic Approaches," I expected to see—but did not—that one of them would be this most straightforward approach:

Let the expected time to exit the museum from the start of entry into gallery A be called a; from gallery B, b; and so on. Then, we have the following:

$$c = 1$$
$$f = 1$$
$$b = 1 + d$$
$$a = 1 + f/2 + d/2$$
$$d = 1 + (a + b + c + e)/4$$
$$e = 1 + d/2 + f/2$$

Solving these equations simultaneously gives $a = e = 15/4$; $d = 9/2$; and $b = 11/2$. The equations are based on the probability of beginning anew from any of the portals to another gallery.

Not only do we get the expected length from the start of entering D (9/2), we also get the expected length from any of the galleries. And this approach needs less "hand waving" than the single variable, h, method described in the section "Defining a Variable."

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Wasserman replies: In my article, I discussed a statistical, a stochastic, and two algebraic approaches to a museum task. One of the algebraic approaches involved defining a variable, h—the expected number of hours to leave the museum from room D—and setting two expressions in terms of h equal to one another, which provided a solution.

As noted by Mr. Kluepfel, another algebraic approach extends this idea further by defining six variables for the expected exit times from each of the six rooms. Creating and solving a system of six equations then provides additional information—the expected length of time to exit the museum beginning from *any* room, not just room D. This approach provides another nice solution to the problem. However, solving a system of six equations may be a more appropriate exercise for more advanced algebra students, perhaps when general methods using matrices are a viable option. The single-variable approach would still be accessible for earlier algebra students.

Depending on the level of the algebra student, a teacher might view one of these solutions as more appropriate than the other, but they similarly draw on the probabilistic formula for expected value in defining their equations and can serve as meaningful algebraic exercises for students.

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