A CLASSROOM MATHEMATICS ACTIVITY: BOUNDARY LINES ON ATHLETIC FIELDS

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Teachers are always on the lookout for ways in which geometric language can be used in real-world settings. We will consider the example of athletic fields.

In each of football, basketball, and tennis the "playing field" is the interior of a rectangle. This interior region is often referred to as "in bounds" while the region in the exterior of the rectangle is regarded as "out of bounds." In the case of baseball, the interior of the right angle with vertex at home plate and with rays defined by the first base/right field and the third base/left field lines is "fair territory" while the exterior of this angle lies in "foul territory."

But what about the line segments themselves for the football, basketball, and tennis rectangles and the angle for a baseball field? Are these boundaries themselves in bounds or out of bounds? In two cases (football and basketball), these boundary line segments are themselves out of bounds. If a player with the ball touches any part of the boundary line, he or she is out of bounds. In the case of football, if the ball touches the plane perpendicular to the offensive "goal line" when in possession of an offensive player a touchdown is scored. A rule related to the out-of-bounds situation in basketball requires a free throw shooter to stay behind the free throw "line."

Tennis and baseball have a different set of rules. A tennis ball hitting any part of the rectangle boundary is regarded as “in-bounds.” Similarly, a batted baseball which hits the angle rays is “fair” at that point. It is ironic that baseball’s “foul lines” are actually “fair lines.”

Teachers and their students are encouraged to geometrically describe the playing fields and their boundaries in other sports.

David Duncan and Bonnie Litwiller recently retired as Professors of Mathematics at the University of Northern Iowa. During their long careers they taught numerous courses for pre-service and in-service mathematics teachers and held several offices in the Iowa Council of Teachers of Mathematics. Dr. Litwiller also served as a Director of the NCTM.