CLASSIFY AND CAPTURE

GETTING STARTED
To play "Classify and Capture," the following materials are needed: sets of commercial or homemade tangrams in four different colors, sorting hoops or appropriate Venn diagrams drawn on large sheets of paper, and a set of teacher-made attribute-label cards. To create the attribute-label cards, list the positive and negative attribute values of the tangrams on card stock. Each card should be labeled with one positive or one negative attribute value. For example, the tangrams have four values for the attribute of color (blue, green, red, and yellow), three values for the attribute of shape (triangle, square, and parallelogram), and three values for the attribute of size of triangle (small, medium, and large). Examples of attribute label cards are "triangle," "not triangle," "blue," "not blue," and "large," "not large" (see figure to the right).

Because students should be able to identify the intersection and union of sets to play the game successfully, they should already have experience with these mathematical concepts and their symbolic representation. Teachers may want to review these concepts before playing the game.

PLAYING THE GAME
Divide students into groups of four and distribute to each group one set of playing cards, three sorting hoops to create the Venn diagrams, and four sets of tangrams, one set each of blue, green, yellow, and red. Each player uses seven tangram pieces of the same color as his or her playing pieces. The label cards are placed facedown on the playing surface, and the sorting hoops are arranged in overlapping circles, as seen to the right.

Player 1 begins the game by turning over three label cards and placing one in each of the three circles of the Venn diagram. All four players then place their tangrams in the appropriate circles, classifying each piece according to the label cards in each of the three hoops. Once these pieces are placed on the playing surface, players are not permitted to retrieve them.

After all tangram pieces have been placed on the playing surface, students use mathematical reasoning to argue against any pieces that are incorrectly placed. Player 1 has the first opportunity to examine the placement of all the tangrams and determine whether any are misplaced. When player 1 identifies a misplaced piece, either another player's piece or her own, she must argue why the piece does not fit the attribute or attributes in the set in which it was placed, then explain where it should be placed. If player 1 argues her point correctly, she takes the piece. If the misplaced piece was one of
her own, she can use it again during the next round. If the misplaced piece belonged to an opponent, player 1 "captures" this piece; it does not go back into play for the remainder of the game.

After player 1 has had the opportunity to identify a misplaced piece, the other players take their turns, following the same procedure to identify misplaced pieces. On each turn, players may identify and remove only one misplaced piece at a time. Play continues until all misplaced pieces have been identified and removed from the playing surface, signaling the end of the first round.

At the beginning of the second round, the three label cards used in the first round are removed, and the players retrieve any of their remaining tangram pieces from the playing surface. Player 2 places three new label cards in the Venn diagram. All players place their tangram pieces on the playing surface, and player 2 has the first opportunity to look for misplaced pieces. The round continues, with players identifying misplaced pieces and arguing for or against the placement of the tangrams, until all the misplaced pieces have been removed from the board. Then a new round begins.

During the game, a player may identify a piece as being misplaced that is, in fact, placed correctly. In this situation, the other players should present arguments to keep this piece on the playing surface. The misidentified piece remains in its correct location on the playing surface, and the next player then takes a turn. A player might also lose all the tangram pieces early in the game. In this situation, the player continues to play when it is his turn to start a round of play by turning over label cards and looking for misplaced pieces to identify and capture during his turn; the player is, however, unable to place any pieces on the board because the pieces are now in the possession of the other players.

Play continues until all the label cards have been used once or until all the players lose all their playing pieces, which experience shows is highly unlikely. The winner of the game is the player in possession of the most tangram pieces (both the player’s and the opponents’ pieces). Ideally, the entire game would be played and none of the players would lose any of his or her tangram pieces. This situation would demonstrate that students have mastered the classification of these objects and the concepts of intersection and union of sets. All the students would be "winners" in every sense of the word.

VARIATIONS

Teachers can vary “Classify and Capture” according to grade level, topic, and student ability. To make the game simpler, teachers could use only a two-hoop diagram, introducing the third hoop when students become more familiar with classifying, or start with only positive attribute value cards and add negative values once the students become more comfortable with the game and concepts. A penalty can be added when a student falsely identifies a game piece as misplaced when it is actually correctly placed by allowing her opponent to take one of her game pieces.

Teachers can also adapt the game to students’ growing understanding of geometric shapes. For example, the game can be played by classifying triangles by sides and angles (equilateral, isosceles, scalene, acute, obtuse, equiangular, and right), classifying quadrilaterals (parallelogram, rectangle, rhombus, square, and trapezoid), and classifying polygons (convex, concave, and regular and by the number of sides). As students move into three-dimensional geometry, they can use the game to classify geometric solids. In algebra classes, students can play the game by classifying subsets of real numbers (rational, irrational, integer, whole, and natural).