MYSTERY AND MOVEMENT

Doing more with
dominoes

JOHN GOUGH

explains

how to turn

an ordinary set

of dominoes into

games of mystery,

movement and strategy.

In previous articles I have discussed dominoes, the real game with scoring (for example Gough, 2000, and Gough, 2001), and other good games and activities using dominoes (Gough 2002). But dominoes, as materials for game-playing, and as a topic for mathematics learning experiences, as suggested by Swan (2001) and Brandreth, 1975), have many other possibilities. Let me add some more.

The following game for two players is based on the commercial game *Guess Who?* (Milton Bradley, 1987) and requires two sets of dominoes.

Which Spots?
— A domino attribute logic game

Getting ready

Two players each use one set of dominoes of their own. Each player places his or her set of dominoes face up, directly in front on the table. Then each player secretly chooses one of the dominoes to be his or her *hidden target* domino, and secretly writes down which domino has been selected.

Playing

Players then take turns. In each turn, a player asks a question, hoping to obtain information that will reveal the other player's hidden target domino. When a question is asked, the answer that the player gives must be truthful — and correct. Players may turn over any domino they believe has been eliminated as a possible hidden target because of the answer to one of the questions. This helps each player think about further questions, and identify possible hidden targets.

Playing the game can be either hard, or easy

The easy way is to allow any kind of question, but this will very quickly be found so easy that it will be better to consider ways of promoting more thoughtful questions. What's easy? Obvious single-digit questions such as, 'Does the hidden target have a 6?' will quickly (with a bit of luck) reveal the secret combination of dots.

How can this be made harder? Ban the easy direct questions about a single-digit, so that questions must be less obvious. Permissible questions, for example, might include: 'Is the spot-total odd?', 'Is one of the numbers a multiple of 2?', 'Do the spots total 7?', or 'Is one of the ends smaller than 5?' Players may find it helpful to write a list of questions they ask, and the answers they receive.

Winning and losing

At any time during a turn, a player may guess the hidden target (e.g. stating, 'I think the hidden target is [2][3]') — but if such a guess is wrong, the player is out of the game and scores nothing. (Further details for playing can be easily adapted from the rules for *Guess Who?*.)

Scoring

Scoring can be based on the number of questions needed to find the hidden target. For example, if each player is allowed a notional total of twenty questions, and a player actually succeeds in identifying the hidden target by asking only 9 questions, then the player scores 20 − 9 = 11 points. However, if a player has used more than twenty questions, the resulting score will be less than 0. (This can be adjusted to allow for player skill, and even handicapping of a skilful player competing with a less able player; for example, allow a skilful player a maximum of ten questions.)

A simpler method of scoring is to allow 1 point for correctly identifying the hidden target, and players compete until one player succeeds in reaching an agreed total of points (e.g. 10 points), or the highest scorer after an agreed time, will be the overall winner.

Mini Which Spots?

A simpler and faster version of this game can be played using only one domino set between two players.

The domino set is turned face-down, shuffled, and each player takes half of the set. Players then turn up their half-set. Each player then secretly chooses (mentally chooses) one of the other player's pieces (without indicating which one), and writes down this hidden target. Play then begins, as usual, with each player aiming to discover the other player's hidden target.

'Stratego' games

Perhaps surprisingly, dominoes can also be used in a board game where pieces move and capture. They are ideal counters for a simplified version of *Stratego* (Milton Bradley circa 1960). *Stratego* is like a mixture of draughts, chess, and *Battleships*, a strategy board game with secrecy(!), and deserves some discussion of its own, before moving to the domino modification.

The key element that makes *Stratego* especially interesting is that players are allowed to HIDE the true strength of their chess-like pieces as they move around the board — until the moment of truth when an attack occurs! Such 'concealed strength' games offer real challenge to players. (See www.inficad.com/~ecollins/stratego for other details.)

Admirals (Parker Brothers) is a later variant on *Stratego*. In fact, *Stratego* is itself a modified board game, based on a modern European board game which was, itself based on a traditional Asian game. Before *Stratego* was marketed by Milton Bradley, a French game, *L'Attaque*, used the same elements. *L'Attaque* was based on a variant of chess, an earlier Chinese game *Dou Shou Qi* (also known as the *Jungle Game*). This uses a similar board and capture system, but with open pieces; that is, the *Jungle Game* is played with 'open' (revealed) pieces, rather than with *Stratego*'s unique 'concealed' pieces. For more about *L'Attaque* see www.abstractstrategy.com/lattaque.html.

English modifications of *L'Attaque* were marketed between World Wars I and II under the names *Dover Patrol* and *Aviation*, and a recent development called *Tri-Tactics* was devised by John Humphries and included in Pritchard (1975). Sid Sackson in *A Gamut of Games* (1969, p. 193) mentions *Stratego* and two other 'concealed piece-value' games, *Radar*

Search (p. 202) and *Battle Stations* (p. 191). R. C. Bell's *Board and Table Games: From Many Civilizations* (1969, pp. 68–70) gives the board, pieces and rules for the *Jungle Game* noting that it appears to be a variant of chess. Two special features stand out in the *Jungle Game*, a game of two opposing teams of 'animal' counters that move orthogonally (parallel to the edge of the board), aiming to capture or 'eat' one another.

First, the board (a rectangular 7 × 9 square-grid board, with pieces starting in the three rear rows of 7 squares) has two 'water' obstacles (each 2 × 3) symmetrically in the three middle rows. Pieces are limited in their ability to move through 'water', or jump over it, or to attack another piece on the land from their own water-position.

Second, pieces have different strengths, and a piece can only eliminate ('eat') another piece that has the same strength, or is weaker than itself. (There is one exception: the rat, which is the weakest piece, can kill the elephant, the strongest piece, by running up the elephant's leg and into the elephant's ear and gnawing its brain.) Capture, as in chess, occurs when a piece is moved appropriately onto the same square as the piece being attacked.

There are two further particularly interesting and original twists in *Stratego*, the modern development of the *Jungle Game*. One is that, before beginning to move pieces, players take turns to place their pieces (secretly) on any empty square in the three rows at their end of the board. This could be imitated in a modified version of chess, by players being free to place their pieces anywhere they like (perhaps writing a starting-position plan on paper, to keep it secret) in the two rows at their own end of the board. Only when the starting disposition of each player's pieces has been decided, and

then revealed to the other player, can players start taking turns to move, one piece at a time, in the usual way.

The other twist is that players show only the position of their pieces, and do not reveal the relative strength of a piece until it is used in an attack. Imagine playing a version of chess, where we can see our opponent's pieces moving, but the actual piece is distinguished only by its colour (as though hidden under a coloured egg-cup). Only when one of our own pieces (itself concealed under a differently coloured egg-cup) creeps up on one of the opponent's pieces, and we declare that we are attacking it, do we discover that it is, for example, a powerful queen (in which case, any of our pieces used in the attack will be defeated, unless we are attacking with our own queen), or a pawn (in which case any piece we use will defeat the discovered pawn).

Stratego is so interesting that is worth seeing if we can imitate it. A set of dominoes is ideal for this, because the blank backs of each domino-piece can be placed to face our opponent, while we are still able to see the spots on the particular domino, and hence can see the particular strength of our own piece (but as our pieces creep towards those of our opponent, we see only the blank backs of the opposing pieces, until one of ours starts an attack, or one of the opponent's attacks one of ours). Notice, of course, that unlike almost all other domino games, this one will be a board game with moving counter-like pieces, not a game of 'I play one piece, you play another' and see what happens.

Domino Stratego

Equipment

Two players use a standard double-six set of dominoes, a set of counters in two colours (such as draughts), and a square grid board like a draughts board, 8 × 8. (The squares of the board must be big enough for a whole domino to be placed entirely inside a square).

One player uses the [6][6] and the other uses the [0][0] as that player's 'flag' piece. The aim of the game is for each player to be the first to attack the opponent's flag, while simultaneously defending his or her own flag.

The rest of the dominoes are placed face-down, and shuffled, then dealt out evenly to each player. Players may look at their own dominoes, but will keep specific domino values secret from their opponent until one player's domino attacks another player's domino, as will be explained. Playing then proceeds in two phases: first placing pieces in their starting positions, and then moving one piece at a time.

Aim

Once players begin moving their pieces, players try to win by capturing the opponent's 'flag', while attempting to defend their own 'flag'.

Setting up

In the first *placing* phase, players take turns to place one domino at a time, anywhere in an empty square on the board. (This may be modified, so that each player is restricted to use his or her two rear rows of squares, as in chess). As each domino is placed, face-down, it is marked with a counter of that player's colour. (At any time, thereafter, a player may lift any one of his or her dominoes to check the numerical strength of the domino, but otherwise the dominoes remain face-down, until it is involved in an attack.)

Playing

When all the dominoes have been placed, players continue taking turns, during the *movement* phase. In a turn, a player may either move, or attack. A move consists of moving a domino (and its colour-marking counter) horizontally or vertically, to any adjacent empty square on the board. An attack takes place when one player's domino is horizontally or vertically beside one of the opponent's dominoes. The attacker declares: 'I attack with THIS piece, against THAT piece', specifying the pieces involved in the attack. Both dominoes are then turned face-up. The numerically stronger piece wins. If both dominoes have the same total of dots, the attacking domino wins. When a domino is beaten in an attack it is removed from the board. A turn ends when the player has completed a move, or an attack.

The game ends when one player attacks the other player's Flag. A Flag always loses when it is attacked (and is unable to attack, although it can move the same as the other pieces), and the player whose Flag is attacked, loses.

Variations

Many variants are possible. Scoring can allow for the number of spots a player still has on the board. Of course, if you have never played Stratego, try it! A simpler strategy board game, like a mix of chess or draughts, can be played on an 8 x 8 board, or a smaller board (e.g. 4×4, or 5×5), using part of a set of dominoes.

Noughts Versus Sixes — A domino board game

One player uses the single-blanks [0][1], [0][2],… [0][6]; the other player uses the non-blank sixes, [1][6], [2][6],… [6][6].

Players place their pieces, face-up, any way they like in their back two rows of the board.

Then players take turns moving one of their pieces one step to an adjacent empty square, horizontally, or vertically. One piece may attack another piece by moving onto the same space. The stronger piece wins. The strength of a piece is determined by its non-nought, or non-six value; for example,

the [0][4] would defeat the [3][6], because 4 > 3. (That is, the Nought or Blank in each of the Noughts pieces, like the Six in the Sixes, denotes which player is using that piece. Hence, the [6][6] has a strength of 6, while belonging to the Sixes player.) Where pieces of equal strength are involved in an attack, the attacking piece wins.

The winner has the last piece standing.

Other variants are possible. For example, the [0][0], and the [5][5], may be used as in chess, as 'King' pieces for either side.)

References and further reading

Brandreth, G. (1975). *Domino Games and Puzzles*. London: Corgi/Transworld.

Diagram Group. (1975). *The Way to Play*. New York: Bantam.

Frey, R.L. (1970). *According to Hoyle: Official Rules of More Than 200 Popular Games of Skill and Chance With Expert Advice on Winning Play (3rd ed.)*. New York: Ballantine Books.

Gough, J. (2000). *Game, Set and Match! — Maths!* Adelaide: AAMT Inc.

Gough, J. (2001). *Learning to Play — Playing to Learn: Mathematics Games That Really Teach Mathematics*. Brunswick: Mathematical Association of Victoria.

Gough, J. (2002). Playing mathematical games: Doing it with dominoes. *Australian Primary Mathematics Classrooms, 7* (3).

Pritchard, D. (Ed.) (1975). *The Games and Puzzles Book of Modern Board Games*. London: William Lusombe.

Sackson, S. (1969). *A Gamut of Games*. New York: Random House.

Swan, P. (2001). *Domino Deductions: Developing Mathematics From Dominoes*. Bunbury: A-Z Type.

John Gough is a lecturer in mathematics education at Deakin University.

APMC