

# diversions

with John Gough

<jagough49@gmail.com>

## *Gemblo and Polyhex Blokus*

### *Blokus*

*Blokus* is an abstract strategy board game for 2 to 4 players. It uses polyominoes which are plane geometric figures formed by joining one or more equal squares edge to edge (refer Figure 1). Polyominoes have been described as being “a polyform whose cells are squares”, and they are classified according to how many cells they have. ie. number of cells. (*Wikipedia*, 2017 March 19). Polyominoes and other mathematically patterned families of shapes were invented by Solomon Golomb, and popularised by Martin Gardner.

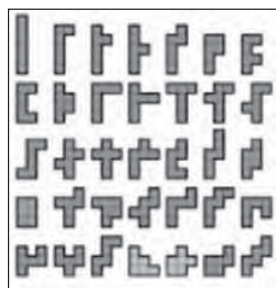


Figure 1: Examples of polyominoes

*Blokus*—using squares—has a sister-game called *Blokus Trigon* that uses polyiamonds, those families of shapes made from unit-sided equilateral triangles joined whole-edge to whole-edge. Polyiamonds were named and popularised by Thomas H. O’Beirne in articles on recreational mathematics in *New Scientist* 1961.

As soon as *Blokus* appeared it became apparent that there ought to be a strategy board game based on polyhexes, those families of shapes made from unit-hexagons

joined together whole-edge to whole-edge. *Gemblo* is one of the possible polyhex games that might be invented. Why obvious? Because both *Blokus* and *Blokus Trigon* used families of shapes made from regular polygons that tessellate. How many are there?

### *Gemblo*

In 2005, *Gemblo* was created by Justin Oh in Korea. It is an abstract strategy board game with translucent, coloured pieces, each of which is made up of one to five hexagons. The six colours are clear, red, yellow, green, blue, and purple.

Despite the obvious similarities to *Blokus*, Oh has stated that when he was inventing *Gemblo* he did not know about *Blokus*. The name is based on the word ‘gem’, alluding to the gem-like colours used for the playing pieces and ‘blocking’—a central feature of playing. The size of the playing board depends on the number of people playing. With 6 players using a hexagonal shaped board that has sides of 8 unit-hexagons.

### *Playing Gemblo*

- *Gemblo* can be played as a one-person puzzle or solitaire, or by multiple players (ie. 2, 3, 4, or 6 persons). A complicated version for 5 players also exists.
- In the two-player version of the game, players use the rules for a standard 4-player game, with each player taking a set of polyhex pieces of two colours, and alternating turns:

Player-1-colour-A, Player-2-colour-B, Player-1-colour-C, and so on.

- With 3, 4 or 6 players, each player uses a set of identical polyhexes in one unique colour.
- Alternatively, three players could follow the 2-player approach, with each player taking a set of polyhex pieces of two colours and in a player's successive turns placing a piece of one, and then the other, of their two colours.
- Except in the case of the two-player version, each player has an identical set of eighteen polyhex pieces in a unique colour: 8 penta-hexes; 5 tetra-hexes; 3 tri-hexes; 1 duo-hex; and, 1 mono-hex.
- The goal is to get rid of all, or end with as few as possible, of your pieces by placing them on the hexagonal game board.
- Players take turns. In each turn, a player chooses one of his or her unused pieces, and places it on the board covering empty spaces.

(No stacking!) The first piece must have one of its unit-hexagons covering the unit-hexagon specified as the start for that player.

- In the six-player version, each player's starting hexagon is one of the corners of the large board.
- Each piece that a player places after his or her first piece cannot touch, either edge to edge, or vertex to vertex, any previously-placed pieces of the same colour. Instead each successive piece placed by a player must be a distance of 1 from another piece of the same colour, where 1 is the length of a side of one of the small unit-hexagons. That is, there is always a gap of a unit-length between pieces of the same colour. We can think of that '1' as a unit-length bridge that implicitly joins two pieces of the same colour: the rules allow two pieces of the same colour to be implicitly joined by several unit-length bridges. Pieces of different colours may abut against each other.



Figure 2: Example of the 18 *Gemblo* polyhex shapes in one colour.

The unit-length joining distance between two pieces of the same colour cannot directly cross through another player's piece, but it can pass between the edge-against-edge junction of two pieces of one or more other players.

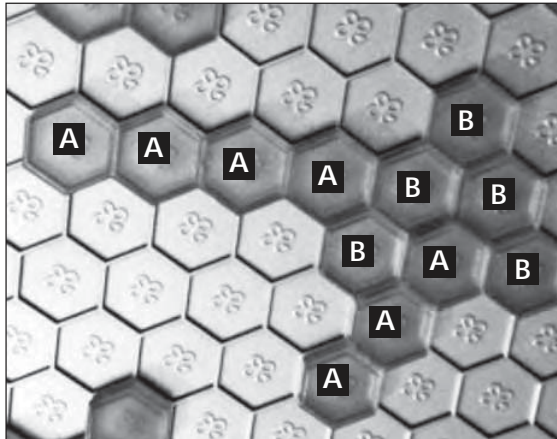


Figure 3: Not a legal move—the 'join' passes through red (Scooter Games, 2013, January 31).

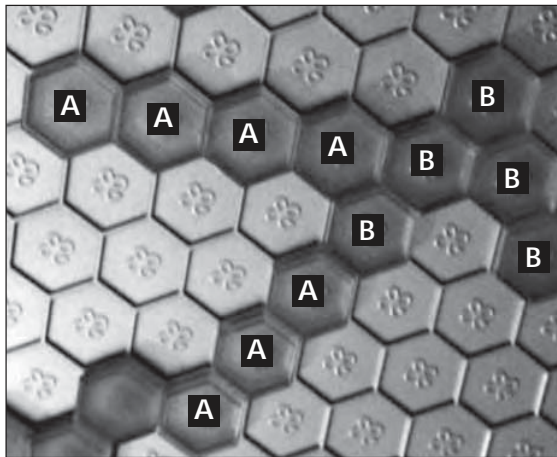


Figure 4: A legal move—observe the join (Scooter Games, 2013, January 31).

The game ends when all players have placed as many pieces as they can. Players then count the number of hexagonal units in the pieces they could not place, and the player with the lowest score wins.

There are further rules for deciding who wins in the case of a draw between lowest scores, and specifying the starting position for each player's first piece.

## Problems to ponder from playing *Gemblo*

Some possible problems to consider during and/or after playing the *Gemblo* game with either a single or multiple players could include:

1. What is the total number of unit-hexagons used to make the six coloured sets of 18 pieces?
2. (a) Is 18, the number of *Gemblo* pieces of one colour, the total number of geometrically distinct polyhexes that can be made using up to five unit-hexes?  
(b) If not, how many distinct polyhexes can be made using up to five unit-hexes, joined whole-edge to whole-edge?
3. What is the area of the 8-hexagon-sided board, measured in unit-hexagons?
4. (a) Can all the playing pieces be fitted together, with no gaps or holes, in a hexagonal styled board?  
(b) If so, what is the size of that board?
5. What mathematically distinct shapes can be made joining together (tessellating) the 18 polyhexes of one colour without holes?
6. (a) What mathematically distinct shapes can be made joining together the 18 polyhexes of one colour with unit-hexagon holes contained within the whole configuration?  
(b) What overall combined shape contains a maximum number of unit-hexagon holes?
7. (b) What overall combined shape contains a maximum number of unit-hexagon holes?
8. Using the 18 polyhexes of one colour:
  - (a) What is the maximum area (measured in unit-hexagons) that can be continuously bounded—'fenced'—by the 18 pieces, joining them together, whole-edge to whole-edge?
  - (b) What is the minimum area that can be fenced?

## Blokus variants

Use the *Gemblo* pieces and board to play with the *Blokus* rules (Wikipedia, 2017 July 22).

- After the first piece has been played, the following turns by players will require them to place pieces so that they do not touch another piece of the same colour, but only at one or more vertices.
- Pieces of the same colour must not have adjacent edges.

## References

BoardGameGeek. (n.d.). *Gemblo*. Retrieved 25 July 2017 from <http://boardgamegeek.com/boardgame/19427/Gemblo>

Scooter Games. (2013, January 31). *Gemblo*. Retrieved 25 July 2017 from <http://scootergames.wordpress.com/2013/01/31/Gemblo/>

Wikipedia. (2017, July 22). *Blokus*. Retrieved 25 July 2017 from <https://en.wikipedia.org/wiki/Blokus>

Wikipedia. (2017, March 19). *Polyomino*. Retrieved 25 July 2017 from <https://en.wikipedia.org/wiki/Polyomino>

World of Board Games LLP. (n.d.). *Gemblo*. Retrieved 25 July 2017 from <http://www.world-of-board-games.com.sg/docs/Gemblo.pdf>

## Further reading

Koster, R. (2006, September 26). Raph Koster's Website: *Gemblo-if-you-like-blokus*. Retrieved 25 July 2017 from <http://www.raphkoster.com/2006/09/26/Gemblo-if-you-like-blokus/>

Wikipedia. (2017, June 24). *Multiple Discovery*. Retrieved 25 July 2017 from [https://en.wikipedia.org/wiki/Multiple\\_discovery](https://en.wikipedia.org/wiki/Multiple_discovery)

The Poly Pages. (n.d.). *Polyhexes*. Retrieved 25 July 2017 from <http://www.recmath.com/PolyPages/PolyPages/index.htm?Polyhexes.html>

