For 1 or 2 players
Ages 8 to adult

Hex-Pave™

Carl Hoff's family of 15 shapely hexagons

Paving combinations
Edge-matching shapes
Strategy games

A product of
Kadon Enterprises, Inc.

Hex-Pave *is a trademark of Kadon Enterprises, Inc., for its puzzle set of 15 distinct hexagons developed by Carl Hoff. Produced under exclusive license. Each hexagon is a unique combination of lengths of sides from 1 to 3 units, where all angles are equal. Every possible combination is included. The areas of the tiles range from 6 to 54 equilateral triangles.*

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The handsome Hex-Pave set is crafted of lasercut acrylic.
Made by Kadon Enterprises, Inc.
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Have questions about any of the puzzles?
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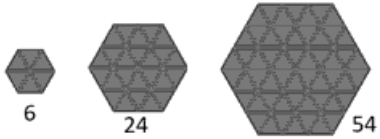
INTRODUCTION

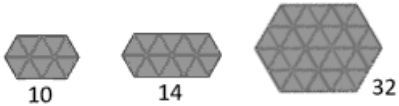
Hex-Pave is a group of 15 hexagons, each a different shape with its own unique combination of lengths of sides, ranging from 1 to 3 units long. The unit length is the length of the side of the equilateral triangles of which each hexagon is composed. We will count the area of each tile in terms of the number of triangles that fill it. Notice that all angles in all hexagons are equal: 120 degrees.

The hexagons can be sorted into matching symmetry groups, each group with its own color. Here is a table of their "profiles". All but one have mirror symmetry.

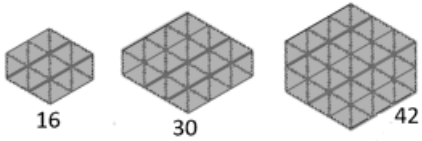
- All six sides equal.



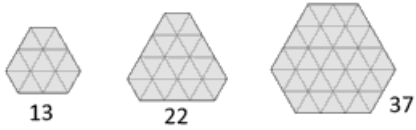
- Two opposite sides equal and longest, the other four sides shorter and equal to each other.



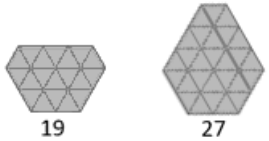
- Two opposite sides equal and shortest, the other four sides longer and equal.



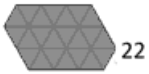
- Three alternating sides equal and shorter, the other three sides equal and longer.



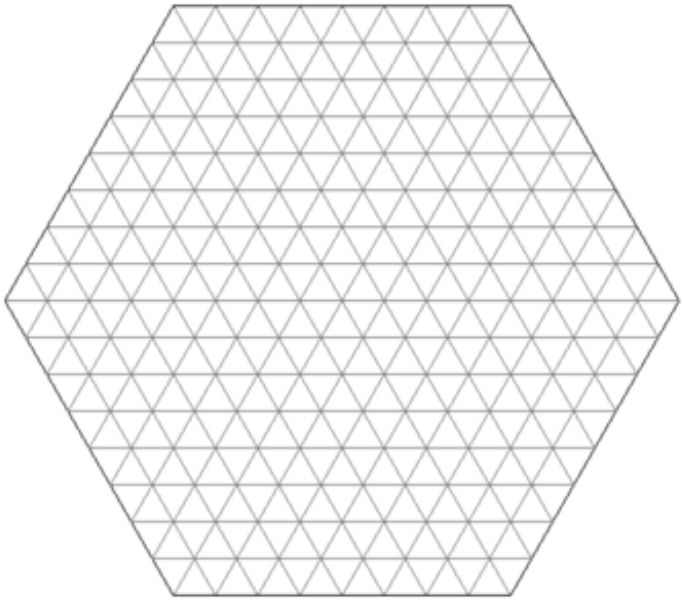
- Three adjacent sides equal, the other three sides with a pair of equal lengths separated by a third length.



- The oddball piece different from the rest, with three lengths of sides opposite each other. It has only rotational symmetry.



The main objective is to pack all 15 pieces into their order-8 hexagonal tray. Pieces may be flipped and turned as needed. When they are all placed, there will be a total of 16 empty equilateral triangles. The set includes enough triangular "fillers" to pack into the empty spaces of various solutions. Here is the grid to fill:



This hexagon is one of twelve different fields of the same area, also known as *hexiamonds*. The set includes a printed grid for the other eleven, like these, to solve with different subsets of the pieces.

The hexagon is the most accommodating of the 12 shapes, and the only one solvable with all 15 pieces. Here are the solution counts for each of the 12 shapes—using all 15 pieces, the 14-piece subset with the smallest hexagon omitted, and the 14-piece subset without the second-smallest hexagon. The back cover shows one of the 3051 with smallest omitted.

Hexiamonds		All 15	14 largest	14 (minus 2nd-smallest)
	I	0	0	245
	L	0	14	1546
	E	0	0	124
	Y	0	6	206
	S	0	5	439
	F	0	2	320
	V	0	10	652
	H	0	0	699
	A	0	0	214
	J	0	6	583
	O	19	3051	76378
	X	0	0	20

PAVING COMBINATIONS

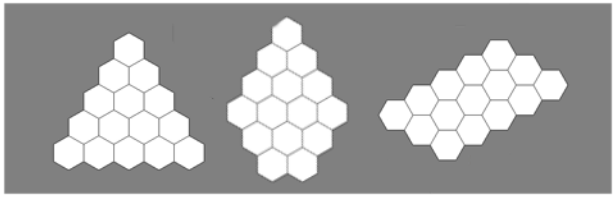
There is a wealth of different puzzle challenges to solve and explore, both within the 12 hexiamond shapes and free-form without a border. A good strategy is to place the largest pieces first and then fill in the smaller ones. Here are some of the special goals:

- Find a solution for each of the 12 hexiamond grids. Use the chart above to attempt only those that have solutions.
- Find solutions for the hexagon with the triangle spaces not touching each other.
- Can you find a solution with the largest number of triangle fillers connected?
- Find solutions for the hexagon with as many pieces as possible of the same color touching.
- Find a solution for the hexagon with no two of the same color touching.
- The hexagon can be solved with any one of the 15 pieces omitted. Can you find a solution for each of these 15 cases?

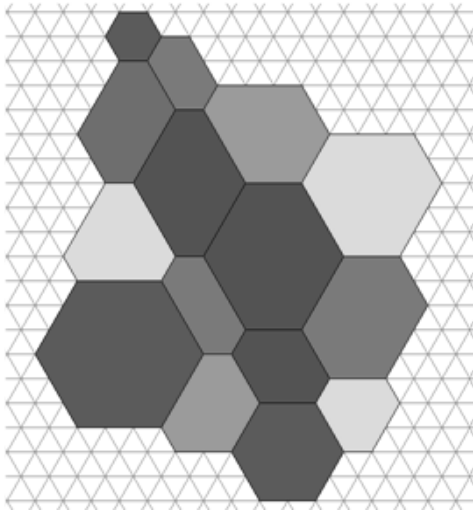
EDGE-MATCHING SHAPES

Think of the edge lengths of each hexagon as the simple numbers of 1, 2, and 3. Your challenge is to fit them together and create shapes that allow all 15 pieces to join so that all touching edges are the same length, with no holes between them. Some possible shapes are a triangle, a pine cone, and a parallelogram. Thanks to Jaap Scherphuis for solution counts.

Triangle, 40 solutions
Pine cone, 30 solutions
Parallelogram, 124 solutions

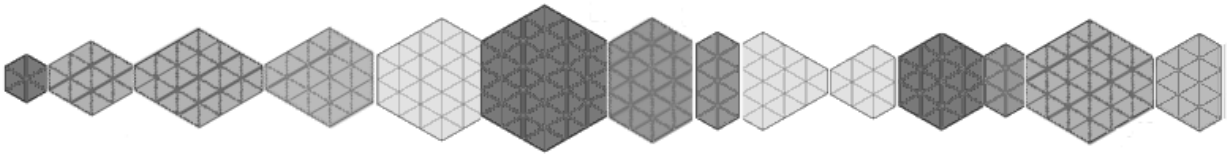


In these edge-matching puzzles you will not see a perfect and even hexagon pattern, although the underlying grid is a regular hexagon/triangle grid. The different sizes and shapes of the pieces will tend to produce irregular and bumpy outlines. Here, for example, is an assembly in the pine cone pattern. Can you find other interesting shapes that can be filled without holes?



SYMMETRIES

All but one of the Hex-Pave pieces have mirror symmetries. The one oddball piece has rotational symmetry. See how many beautiful free-form designs you can create by assembling the pieces symmetrically. Open spaces are allowed. Here's a long streak neatly matched.

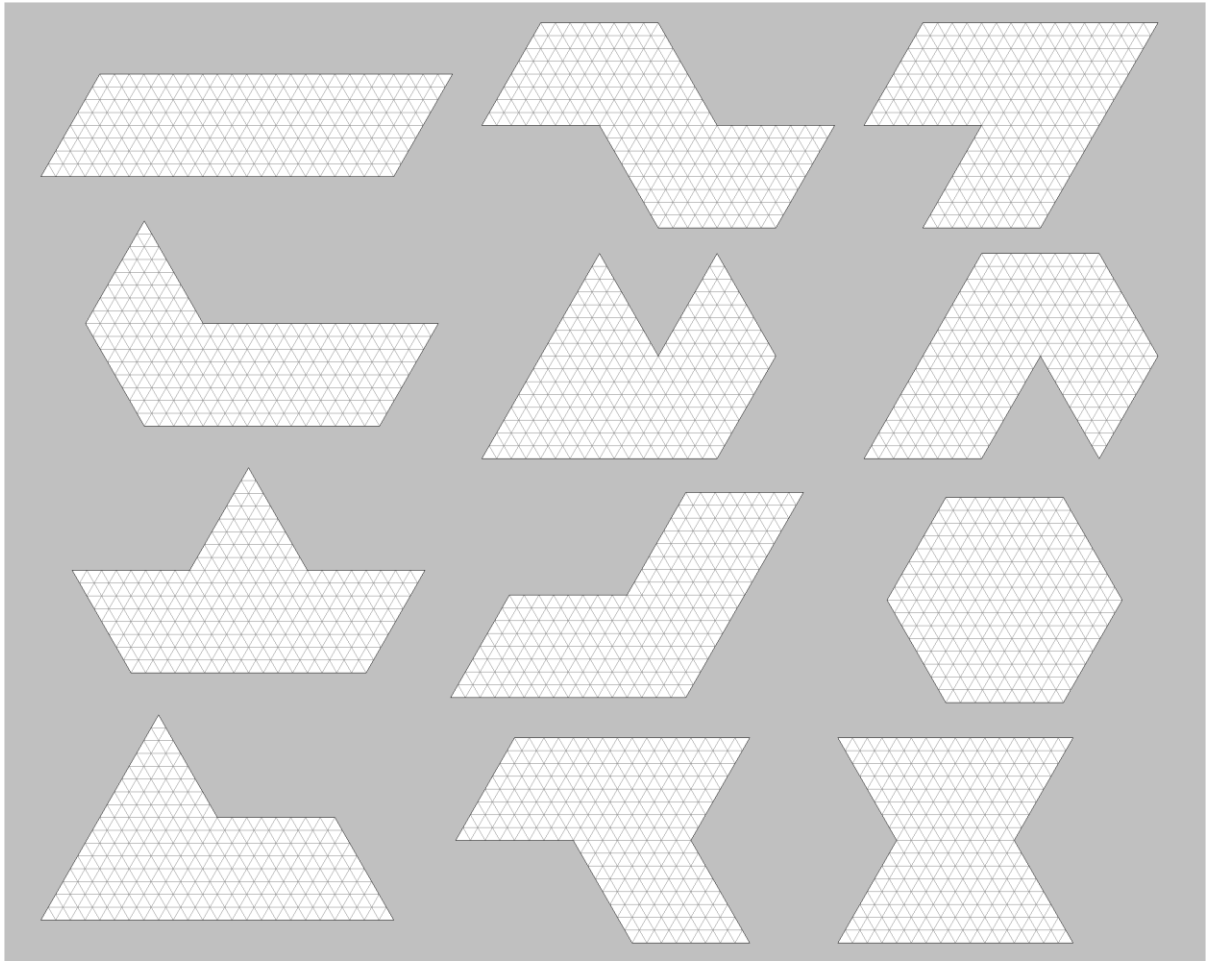


COMPETITIVE SOLVING

With two sets of Hex-Pave, two players can challenge each other to see who can fit the most pieces into the tray in a given time. In case of a tie, the area of the *unplaced* pieces is totaled for each player, and the player with the *lower* total wins.

CORNERS ONLY

Now for a change of pace. The opposite of getting as many of the Hex-Pave hexagons as possible into a defined space is to spread them as far as possible, touching each other only at corner tips. See a sample of the hexagon with tip-to-tip pieces on page 11. Each of the dozen hexiamond shapes, shown below, is included with the Hex-Pave set as a working grid. What are the most and the fewest number of pieces you can fit on each of them where only corners touch? Use the gridlines to line up the pieces accurately. Flip and turn them as needed.



PAVE-BLOCK

A strategy blocking game for two players

Start: The empty tray between the two players; pieces off to the side in a common pool to draw from.

Goal: Decide before starting which of two goals to aim for: 1) Last player able to fit a piece into the tray *wins*. 2) Last player able to fit a piece into the tray *loses*.

Play: Decide order of play. Second player chooses a hexagon from the pool and places it in a corner of the tray. Players then take turns choosing one tile from the pool and placing it into the tray, always sharing a side with either the tray border or a piece already placed.

Any number of sides may touch, and any number of empty spaces may form. Pieces once placed do not move. Play until no more pieces will fit. The "winner", depending on the goal selected, is awarded a number of points equal to the total area of the pieces remaining in the pool.

On the next round, the other player goes first. Alternate order of play with each round. Play an even number of rounds—two, four, or six. The player with the highest accumulated point score is declared the overall winner.

Strategy: Depending on the goal chosen, your aim is to either block up space so none of the pieces remaining in the pool can fit, or to make moves that still allow another piece to fit, thus always aiming to leave room for the other player's next move. So when do you think is it more advantageous to use up the largest pieces, and when is it better to use the smallest pieces?

Variation: For a more complex version, add the restriction that pieces of the same color may not touch each other!

PAVE-MATCH

An edge-matching game for two players

Start: The tray is not used. Players take turns choosing pieces from the pool of 15 until each has 7 pieces. The remaining piece is placed in the play area between the players and serves as the starting point for the game. The playing field has no defined shape or area.

Goal: To earn points by playing the last possible piece on the field.

Play: The first player places a piece against the starting tile so that one of its edges matches perfectly the length of one of its edges: length 1 against a length 1 edge, a length 2 against a length 2 edge, and a length 3 against a length 3 edge. Unequal lengths may not touch.

The second player now places a piece such that at least *two* edges match perfectly with at least two pieces already on the field. If a position opens that neighbors 3 or more pieces, and the player whose turn it is possesses and plays a piece that matches all the neighbors, that player earns a bonus of 1 point for each side joined in excess of the required 2.

Continue taking turns joining tiles by their corresponding lengths of sides, always touching/matching at least two pieces already played. When a player is unable to make a match, the round ends and the other player is awarded 1 point. If the second player is able to place the very last piece, that player earns 2 points.

The player who was second in the previous round now chooses first from the pool of 15 pieces. Order of play switches with each round. Play until one player is at least 3 points ahead, provided an even number of rounds are played.

Variation: Reverse the winning condition so that the objective is to have the fewest number of points at the end of the game. This radically changes the strategy of playing to create good openings for the other player's pieces.

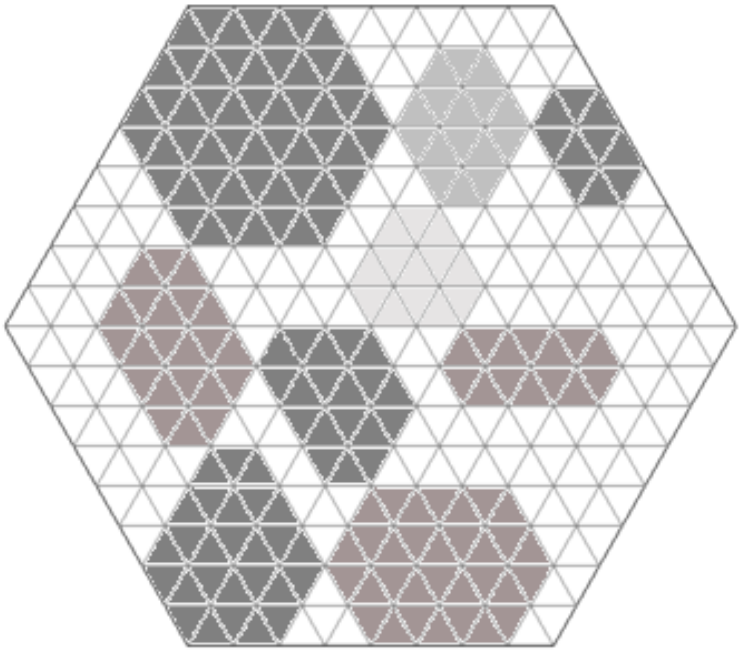
TIP TO TIP

A touchless blocking game for two players

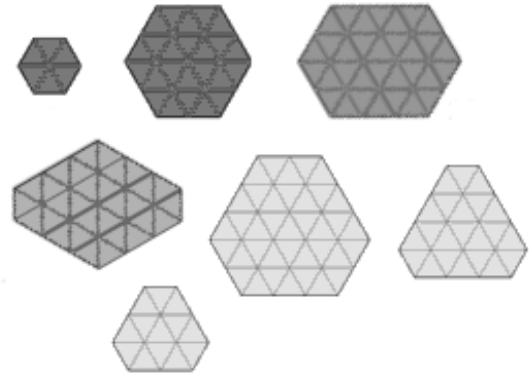
Start Any one of the 12 printed grids between the two players; pieces off to the side in a common pool to draw from.

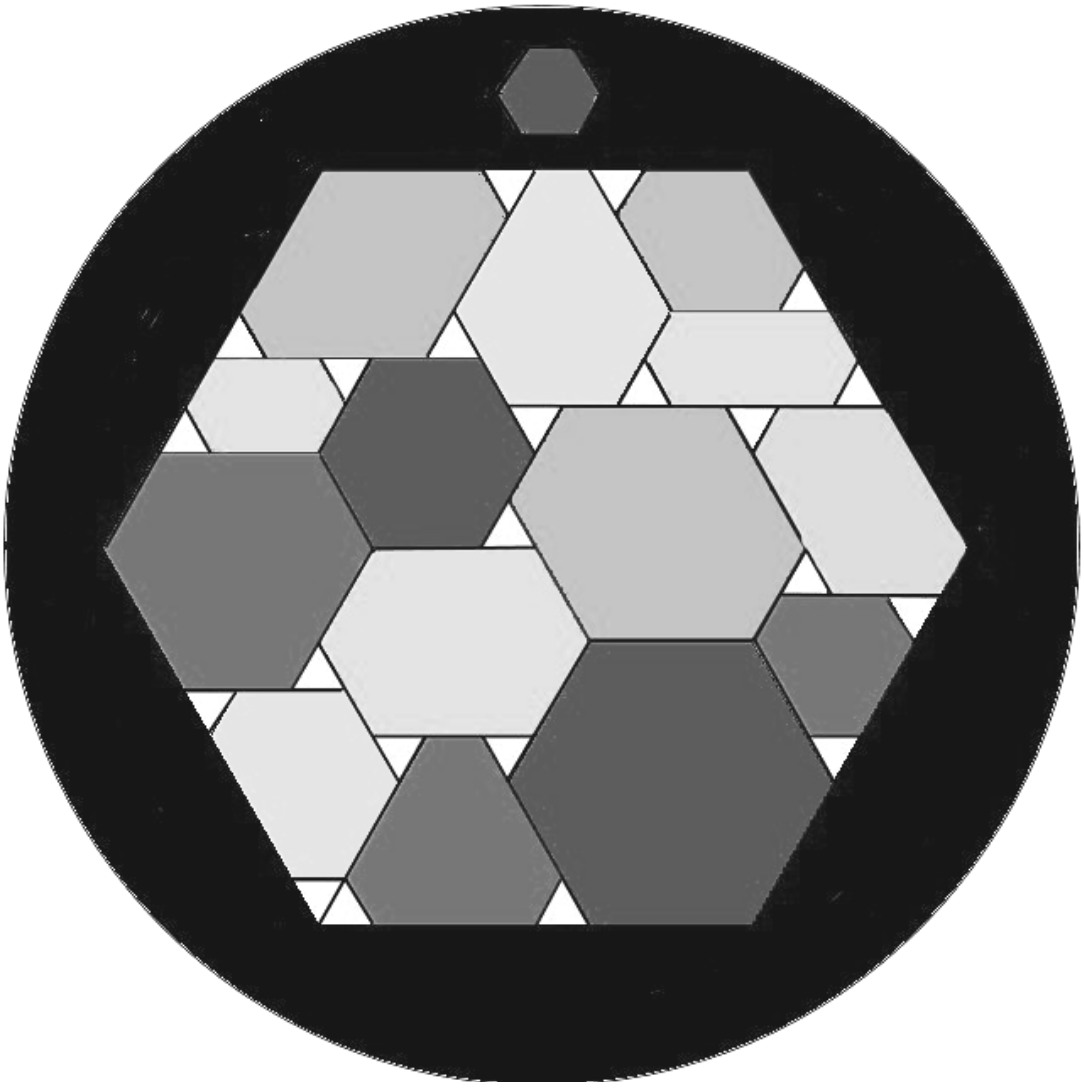
Goal: To fit an odd or even number of pieces onto the grid. If odd, neither player wins. If even, both players win.

Play: Take turns choosing a piece from the pool and placing it on the grid to line up with the grid pattern. Place the first piece in a corner. Pieces thereafter are placed so they touch only at the tips of their corners, never along a side. A piece being placed must touch at least one other piece, nothing floating free.



Left: A sample game part-way through. Which of the remaining pieces would you add, and where, to end with an even number of pieces on the board? Or is it even possible?





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