

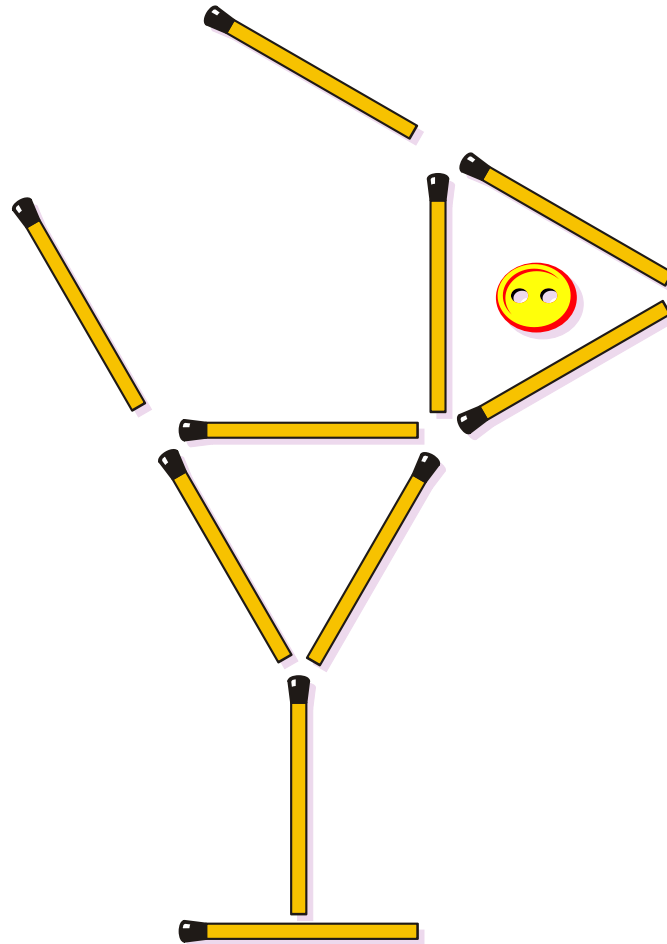
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WI2 print 'n' play winter collection

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Puzzles



The Bird

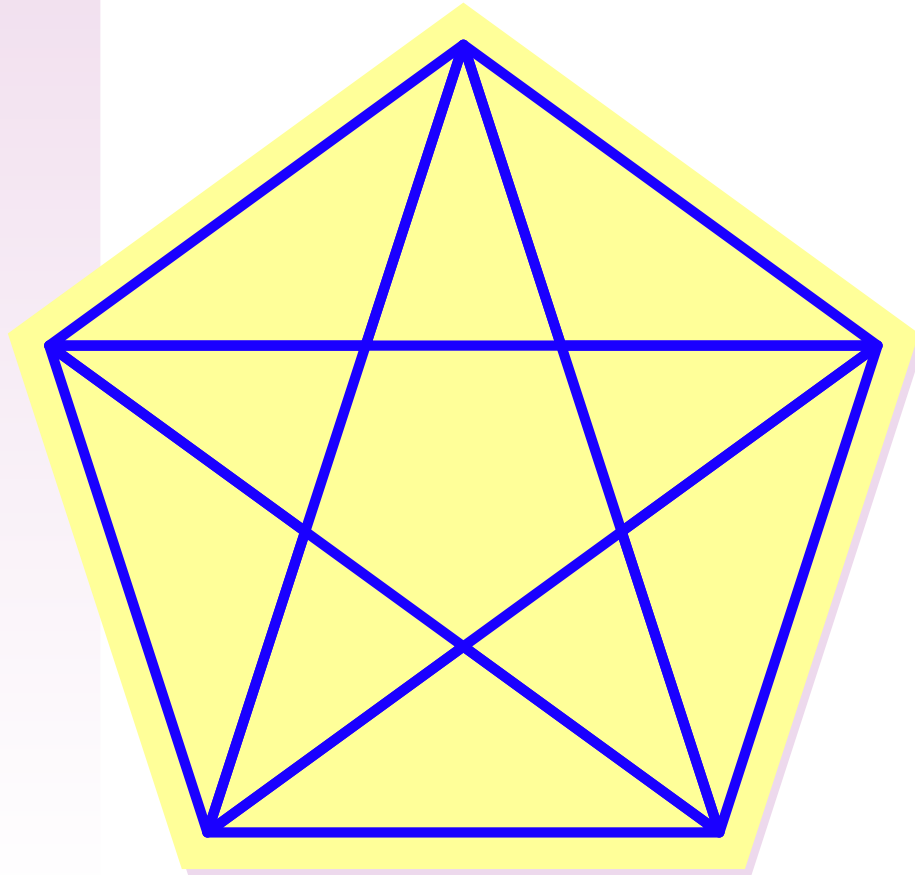
by Peter Grabarchuk

Form the depicted bird with ten matches and a button as shown.
Move two matches and a button to make the bird looking in another direction.

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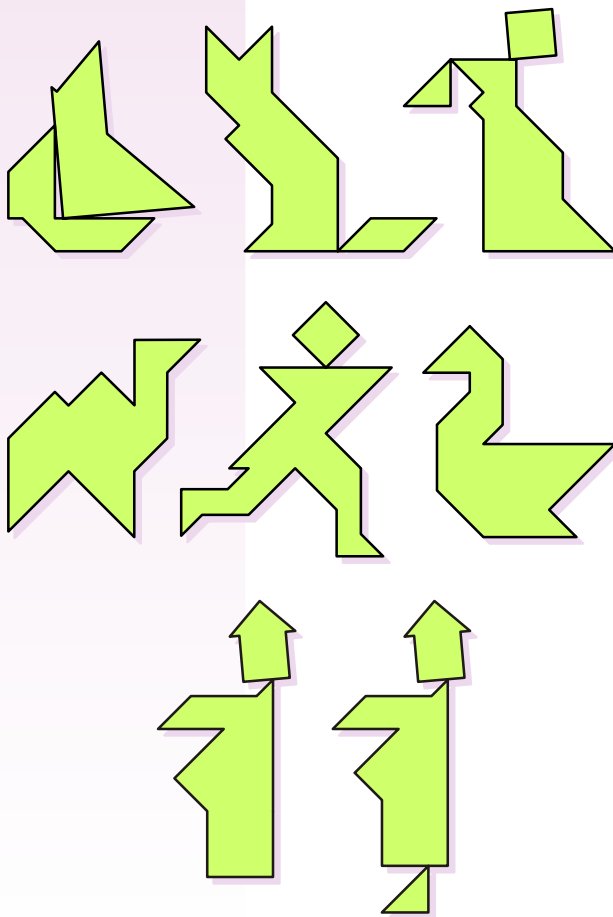
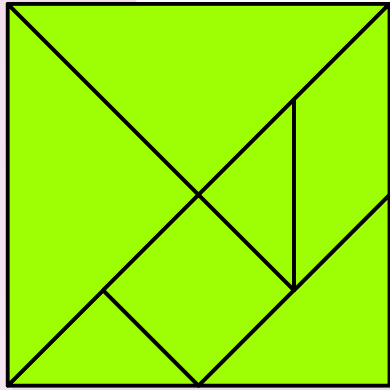
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Counting the Triangles

by Henry E. Dudeney

The question is how many different triangles are hidden in this figure?



The Tangram

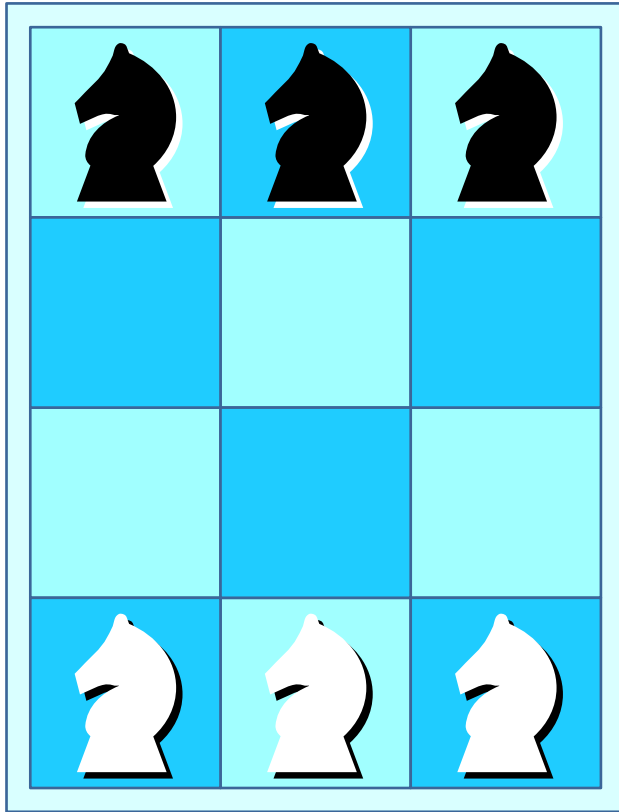
Without doubt the Tangram is the most popular put-together puzzle, and one of the most well known puzzles ever. The origins of the Tangram are unknown, but the earliest references date back to the beginning of the 19th century, China. That's why the puzzle is also known as the Chinese puzzle.

The puzzle consists of seven pieces - tans - obtained by dividing a square as shown in the illustration.

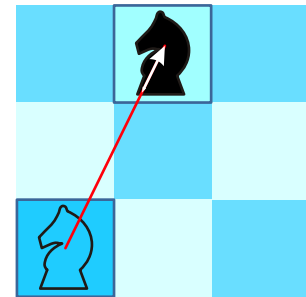
Now you're able to arrange them in many different ways making an infinite number of nice, fun, and sometimes very puzzling figures. For every figure you have to use all the seven tans. You're allowed to rotate the pieces as you wish, and even flip them over. But you can't overlap the pieces.

We've chosen just a few most popular figures that you may assemble using all the seven tans. They will give you a good taste of the puzzle.

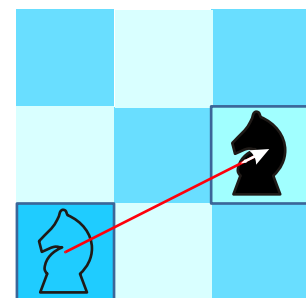
The two Men in the bottom row are developed by Henry E. Dudeney, and demonstrate a beautiful paradox. Both Men are assembled with all the seven tans, but one of them has a foot, while the other hasn't. Can you make both men, and then explain what's happening with the foot?



1



A



2

B

Six Knights

by Henry E. Dudeney

Place three black and three white chess knights on a 3x4 board as shown in Figure 1.

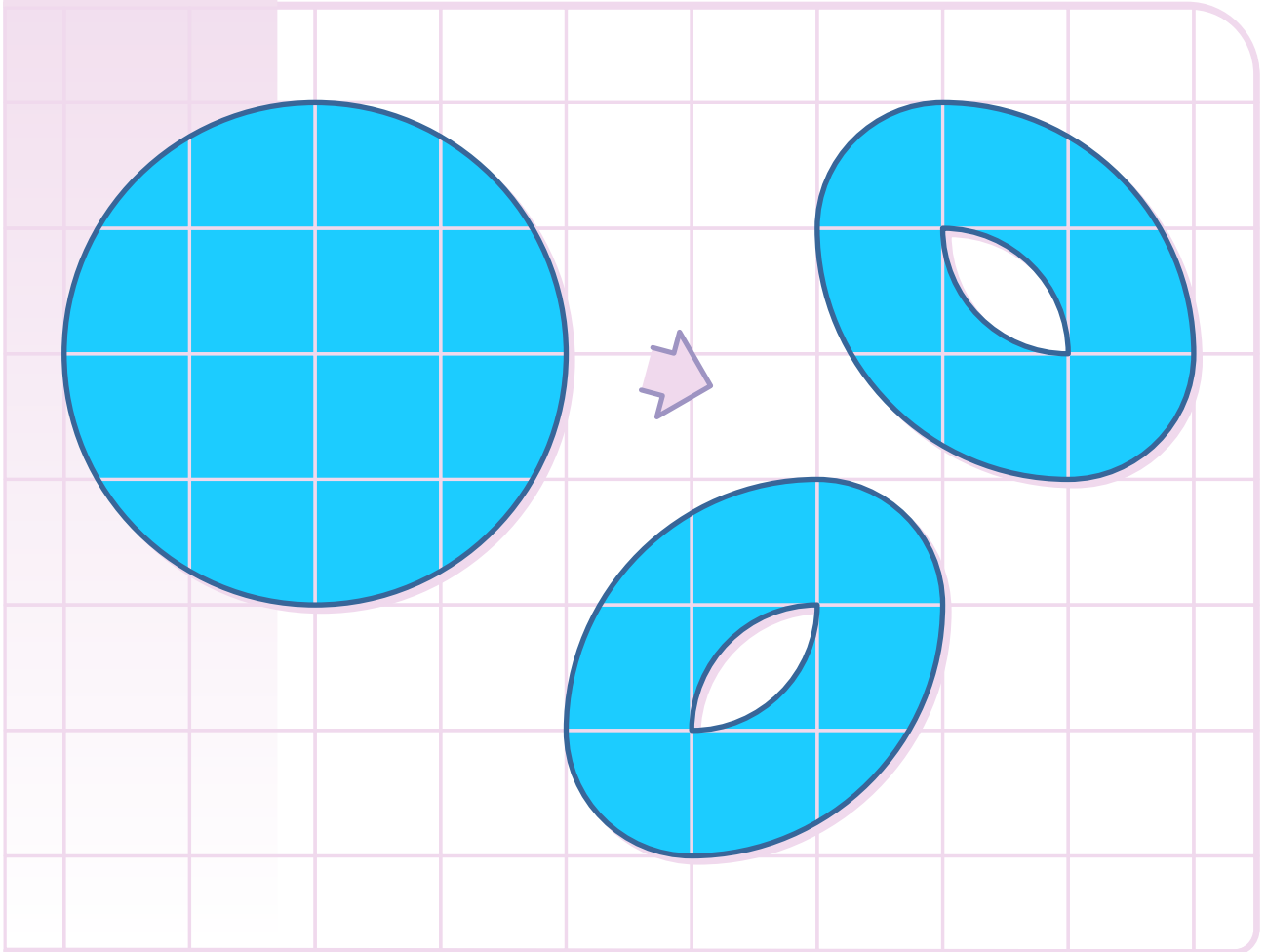
The object is to exchange black and white knights in the fewest possible number of their moves (some examples of such moves are shown in Figure 2, a and b).

Moves should be made by black and white knights in turn. And after every move none of the knights should be under attack of any of the knights of the opposite color. Only one knight can be on a square at the same time.

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Disk in 2 Ovals

by John Jackson

The object of this puzzle is to divide the circular table top (disk) into certain number of pieces that could be rearranged into the seats of two oval stools with open handholds as shown in the illustration. What is the fewest number of pieces required to complete this task?

John Jackson proposed this puzzle in 1821 and his solution contained eight pieces. Eighty years later Sam Loyd demonstrated the solution which consisted of six pieces only. Can you discover both solutions?

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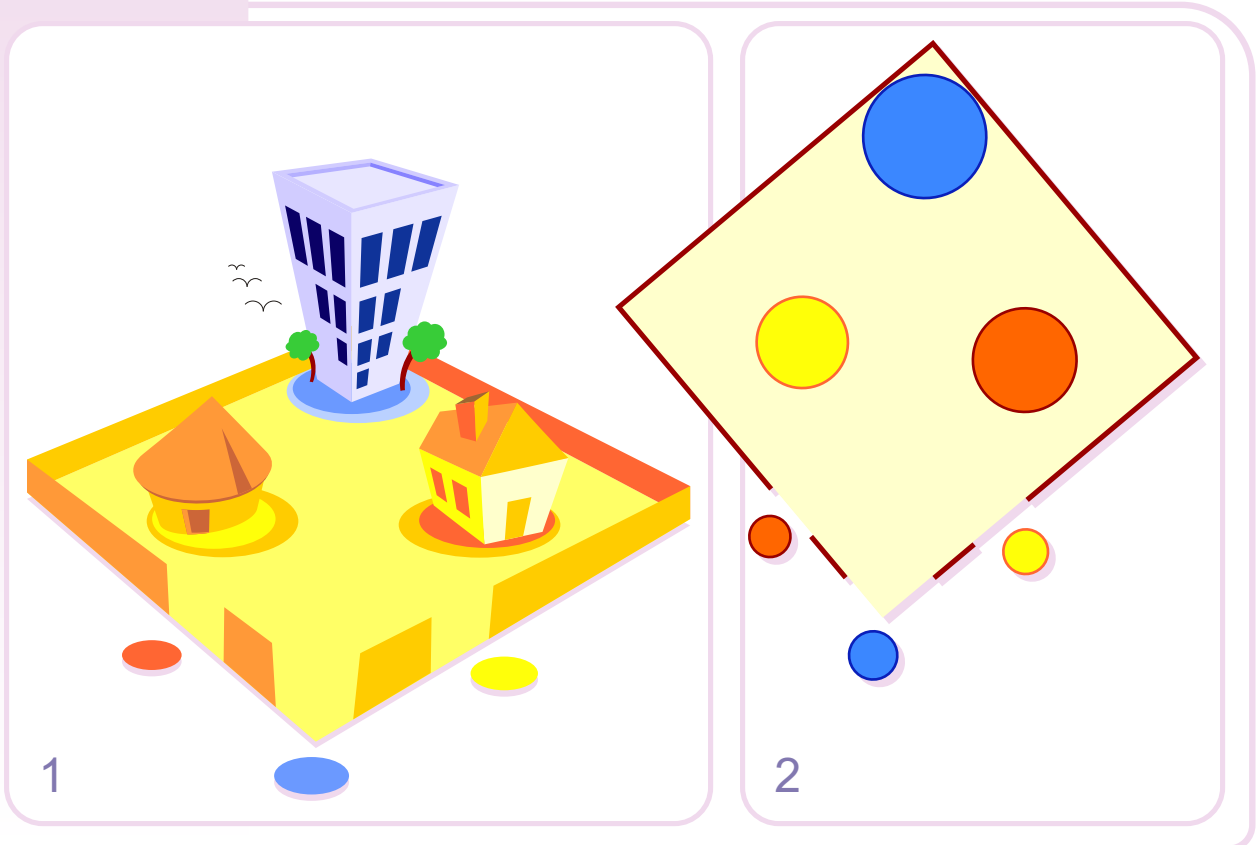
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The Alkborough Maze

Trace your path through the maze from the entrance at its top to the white spot at its center.

The real maze is cut in the turf at Alkborough in Lincolnshire, England. The maze known as "Julian's Bower" is the unicursal maze, first mentioned in 1697 and believed to date from the medieval period. The turf maze was still used for May-eve games until about 1850.



The Quarrelsome Neighbors *after Sam Loyd*

Three neighbors - the owners of the skyscraper, the bungalow and the cottage - who share the small park, as shown in Figure 1, have a falling out. This led them to the decision to build three pathways from their houses to the gates of the park (every path to another gate), so that none of the paths cross each other!

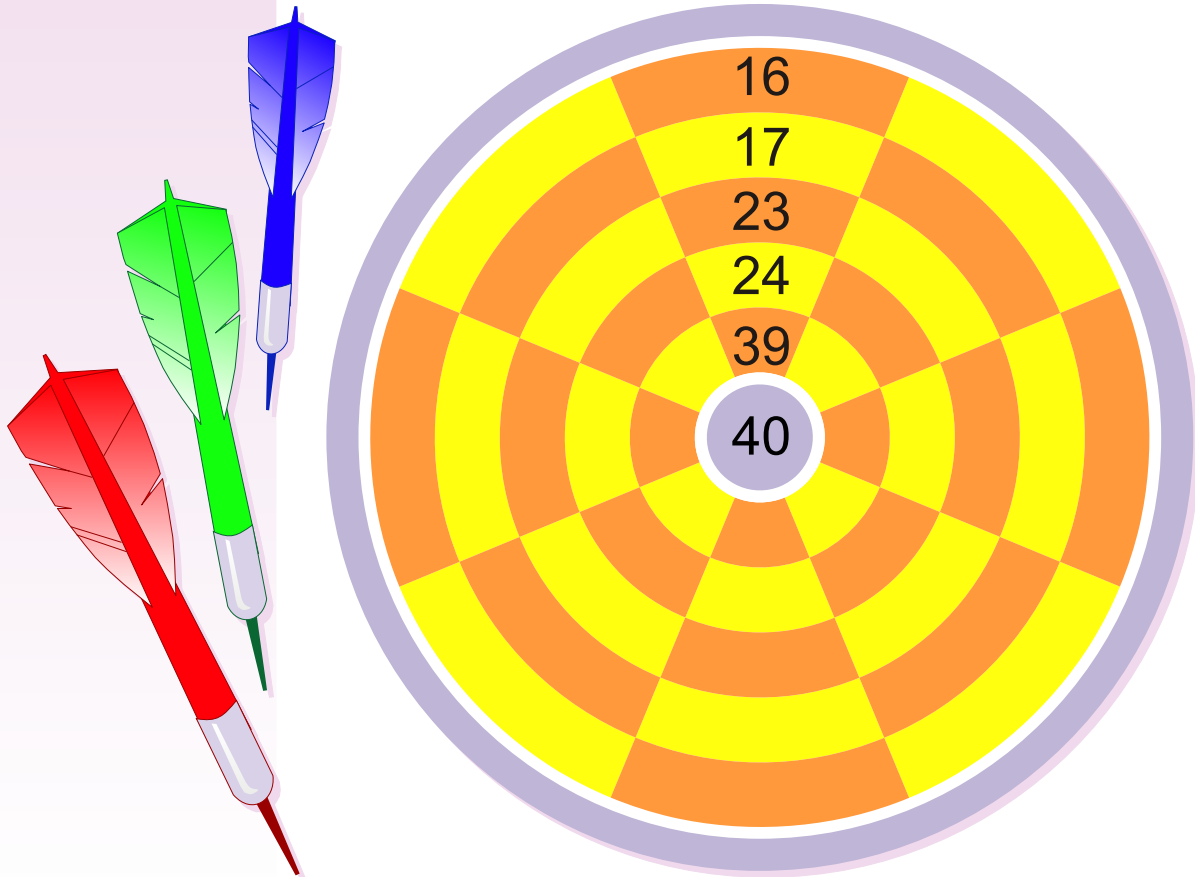
The owner of the skyscraper wants to build the path to the central gate. The owner of the bungalow (on the left) wants to make the path to the gate on the right, and the owner of the cottage (on the right) wants to have his path to the left gate. The colors of the lawns around the houses and the respective spots next to the gates will help you to understand their plan. Please, notice that none of the path can go behind the skyscraper (Figure 2)

How do the quarrelsome neighbors have to build their pathways?

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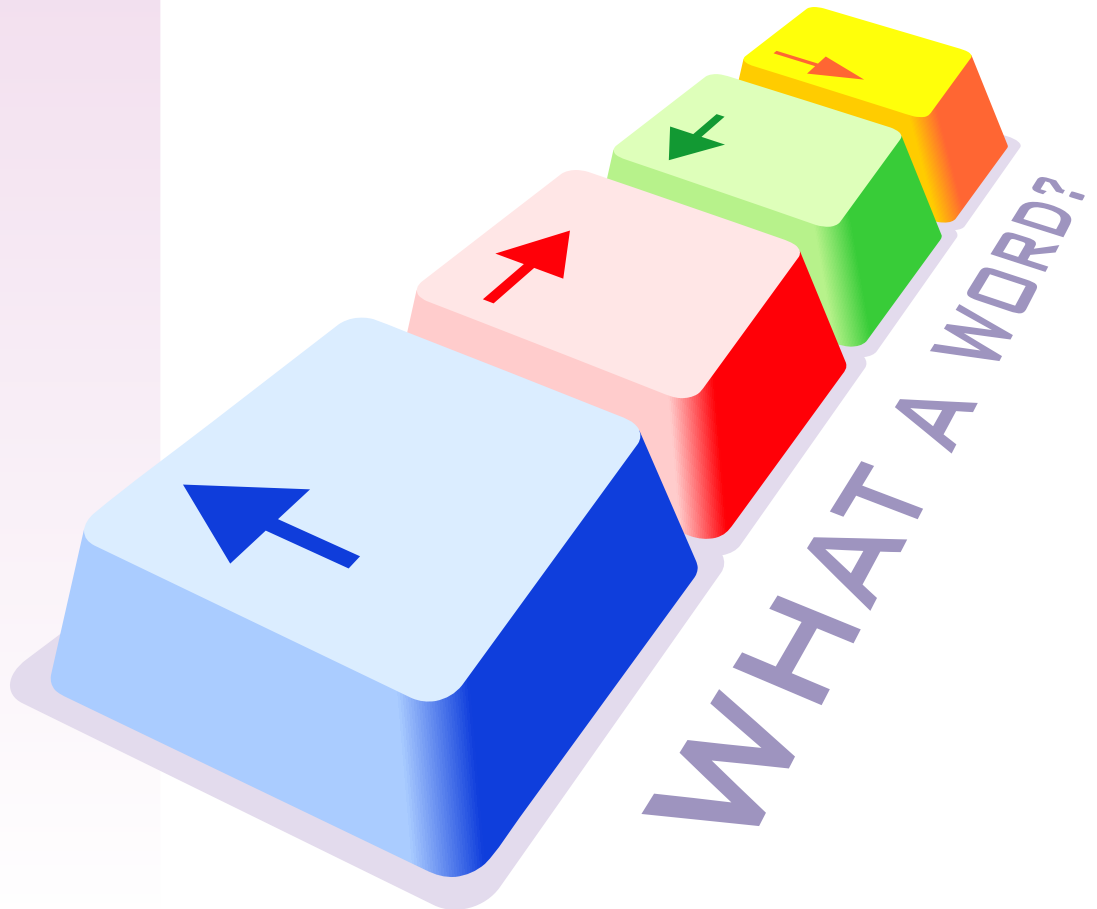
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Darts Count

after Martin Gardner

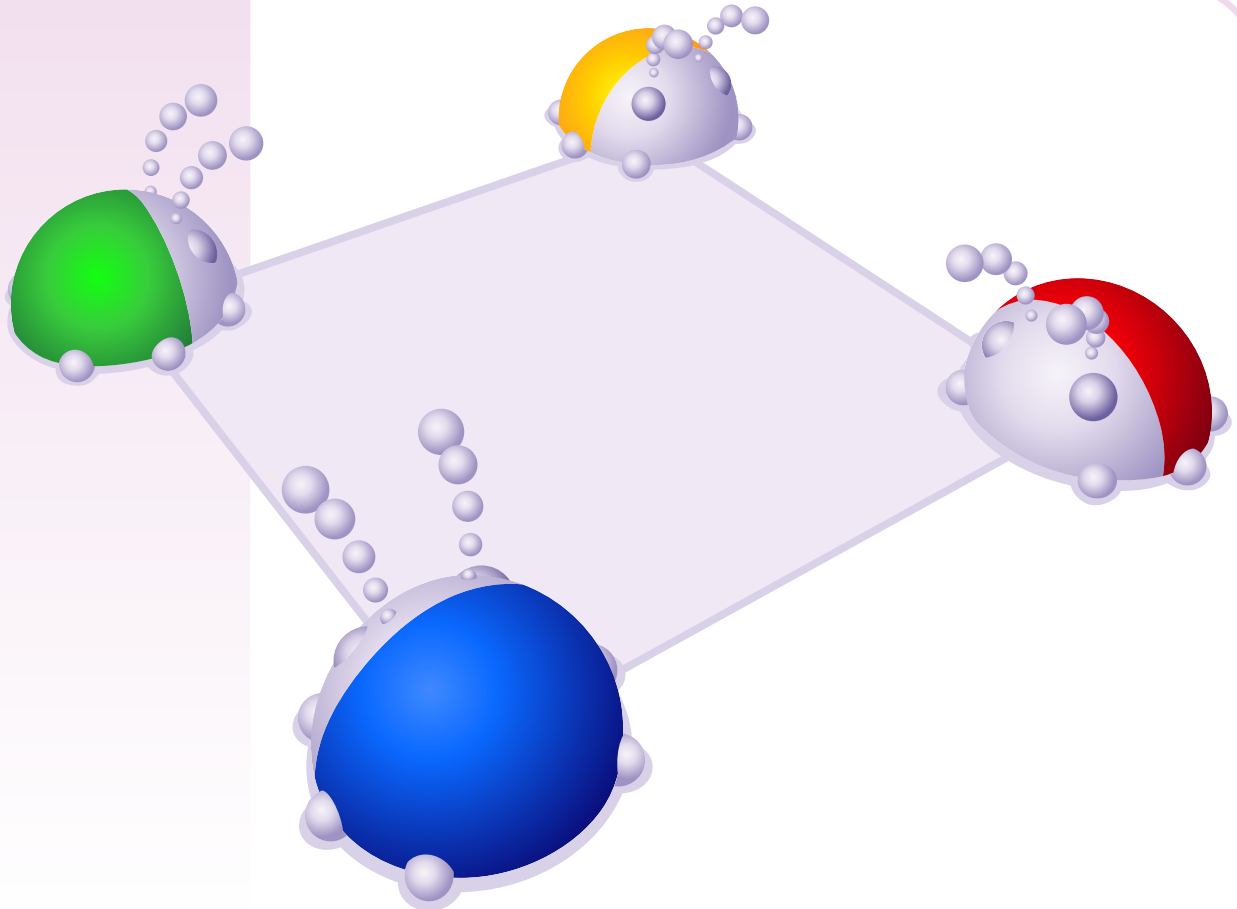
Can you find a pattern how to toss some number of darts in order to score exactly 100? You may use as many darts as you like. Hint: Try first for a score of 50.



Key Word

after Martin Gardner

The four arrows on the four keys shown in the illustration can be replaced with the four respective letters which will allow you to type a familiar four-letter word starting from the left key in the row. What word is it?



Bugs' Traffic

after Martin Gardner

Four bugs, the Green, the Yellow, the Red, and the Blue occupy the corners of a square as shown in the illustration. The side of the square is 10 units long. Simultaneously the Green bug starts to crawl directly toward the Yellow one, the Yellow toward the Red, the Red toward the Blue and the Blue toward the Green.

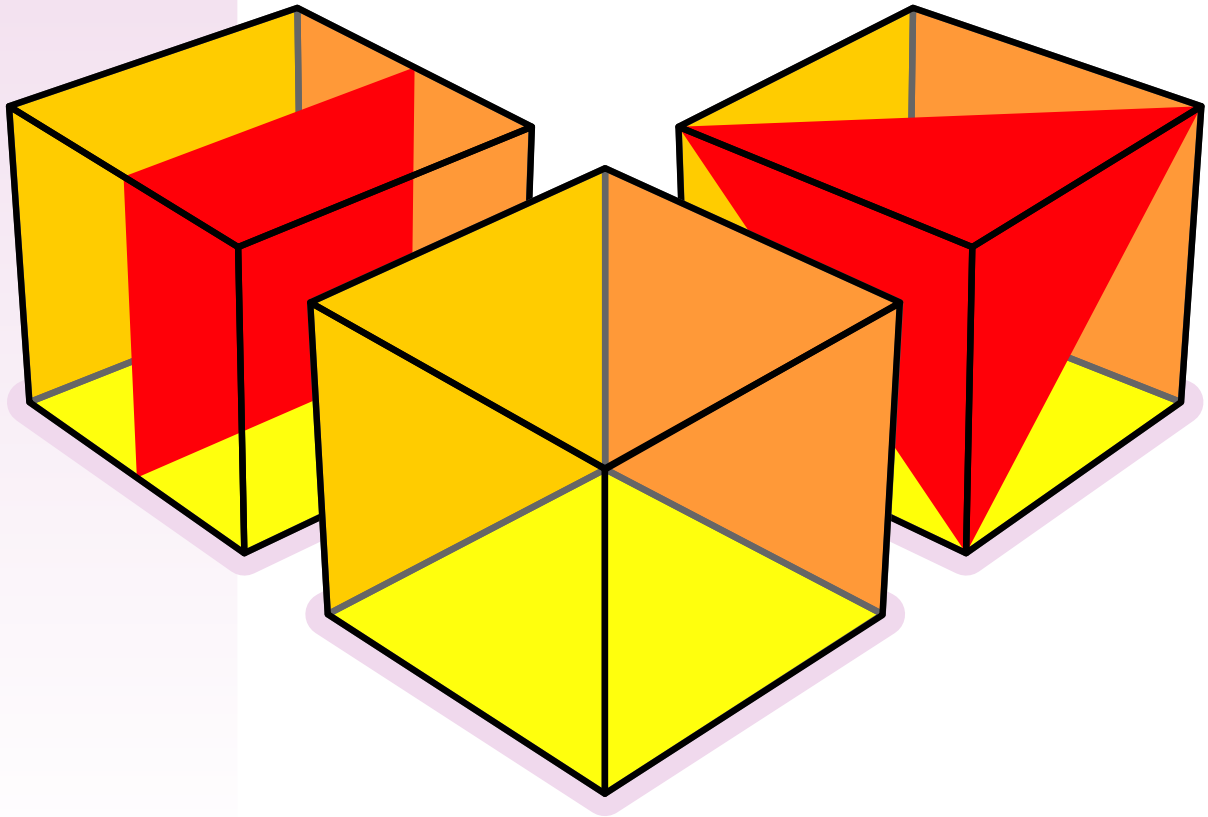
Since all four bugs crawl at the same constant rate, they will describe four congruent logarithmic spirals which meet at the center of the square.

Thus the question is: how far does each bug travel before they meet?

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Hexagon Inside the Cube

after Martin Gardner

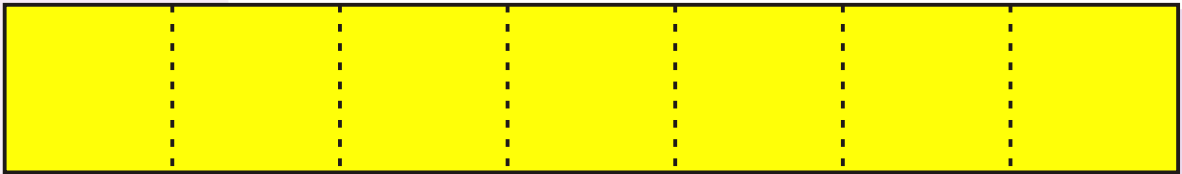
A plane which passes through the cube's center produces a cross section in form of a square (the leftmost cube in the illustration). A plane which passes through the three corners of the cube only produces a cross section in form of a regular triangle (the rightmost cube in the illustration).

The objective is to find the way how the plane should pass through the cube in order to produce a cross section that is a regular hexagon. If the cube's side is one unit, what is the side of the hexagon?

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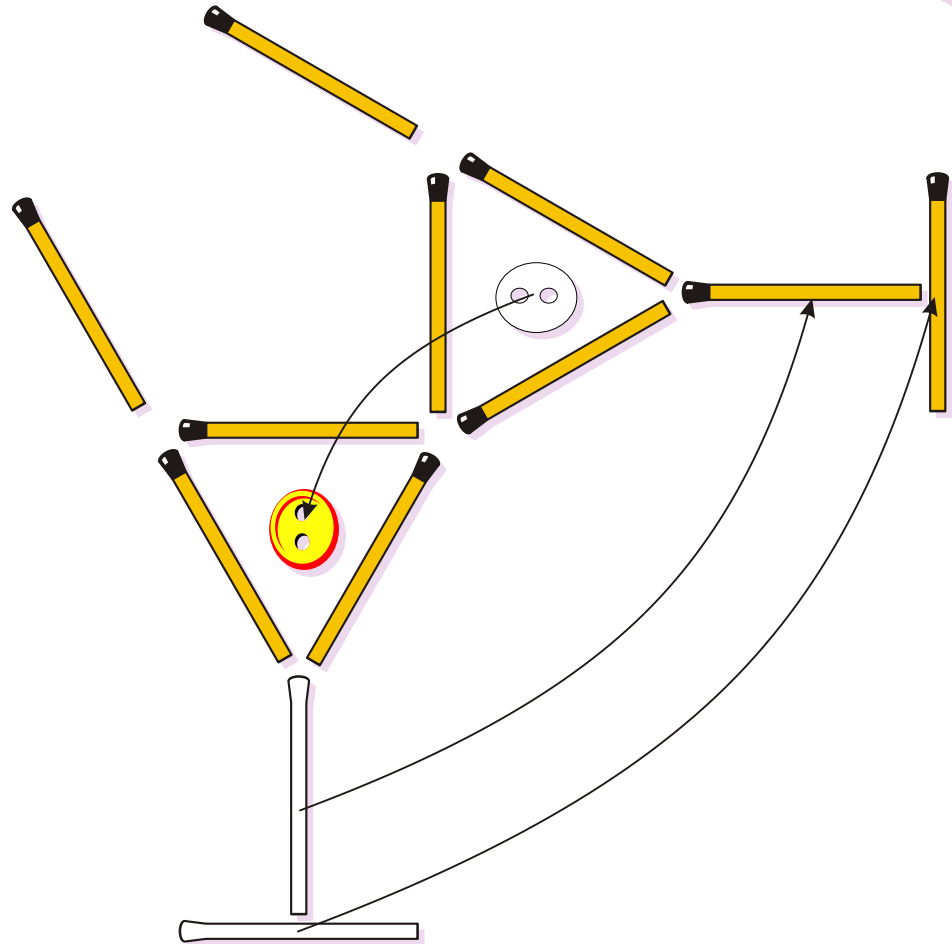
Strip to Cube

after Martin Gardner

The minimal strip that can be folded into a one-unit cube is one unit wide and seven units long (1x7) as shown in the illustration.

The object is to show how it can be done.

Print 'n' Play Winter Collection
Solutions



The Bird (solution)

The solution is shown in the illustration.

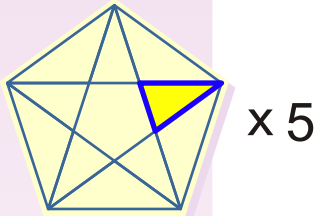
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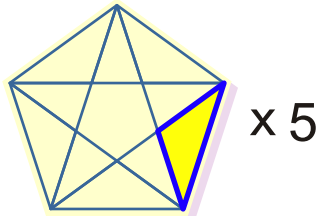
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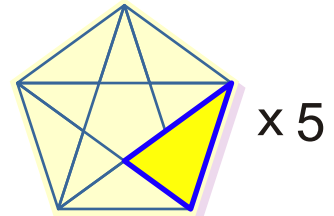
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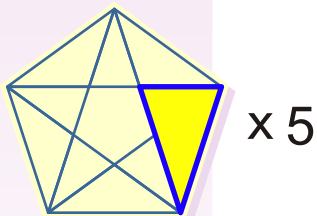
x 5



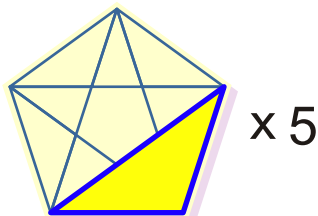
x 5



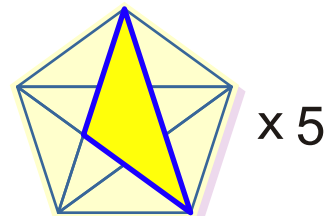
x 5



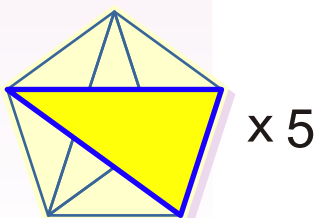
x 5



x 5



x 5



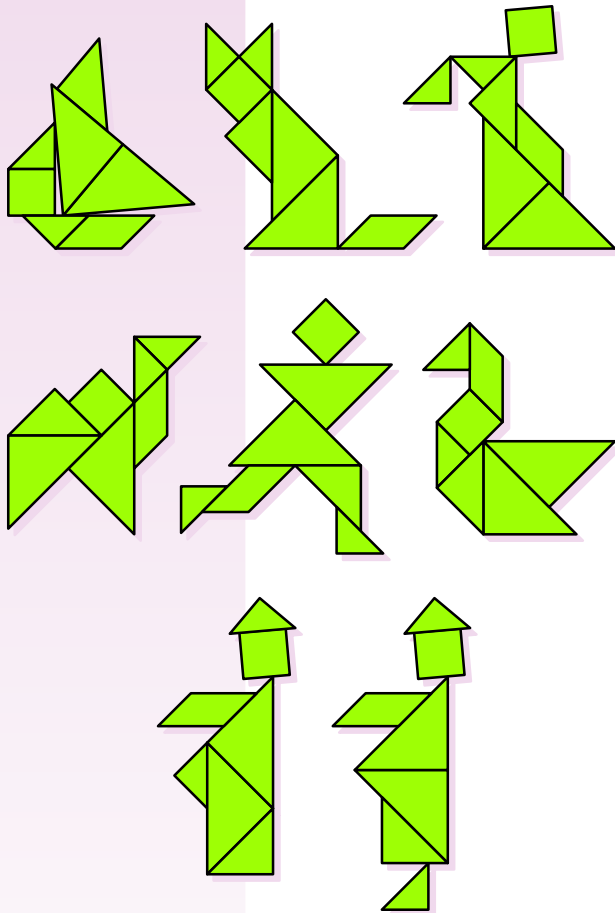
x 5

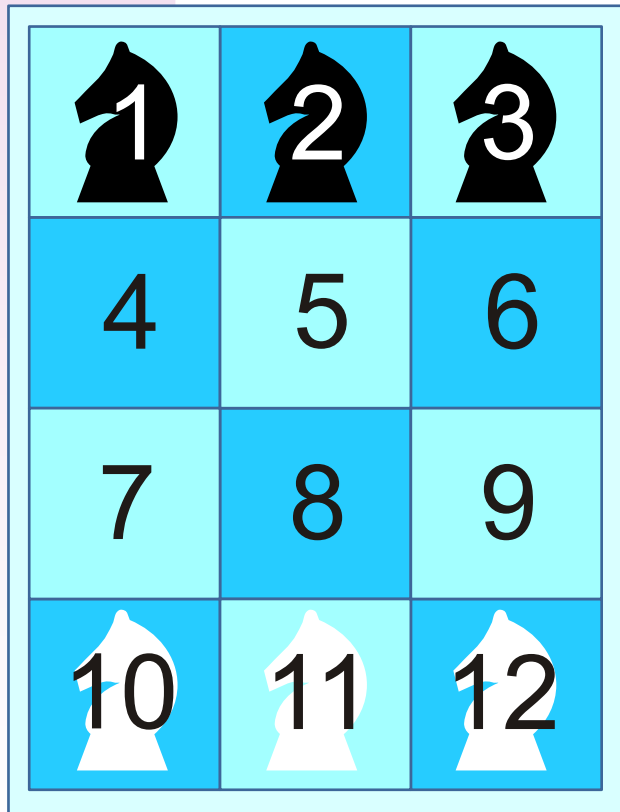
Counting the Triangles (solution)

There are seven groups of triangles shown in the diagrams above. Each group consists of exactly five triangles with every triangle rotated 72 degrees around the center of the pentagon; one triangle from every group is highlighted in the respective diagram. So the total number of the triangles in the pentagon is $7 \times 5 = 35$.

The Tangram

The solutions to all the figures are shown in the illustration.





10-5, **1-8**;
 11-6, **2-9**;
 12-7, **3-4**;
 5-12, **8-3**;
 6-1, **9-10**;
 7-6, **4-9**;
 12-7, **3-4**;
 1-8, **10-5**;
 6-1, **9-10**;
 7-2, **4-11**;
 8-3, **5-12**.
 (22 moves)

Six Knights (solution)

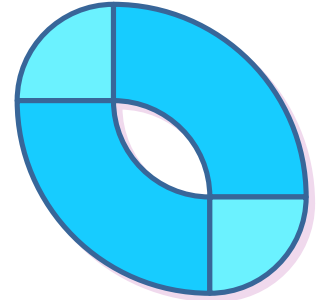
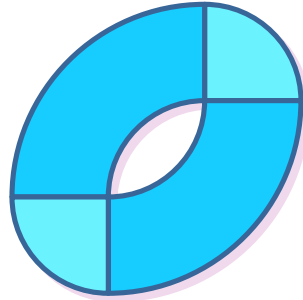
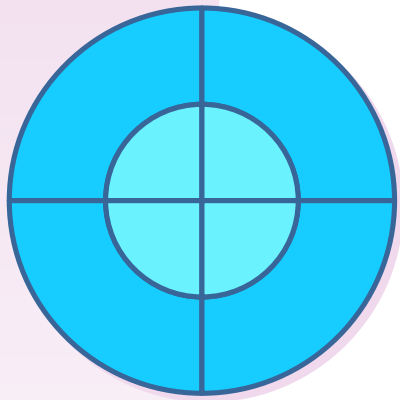
The minimum number of moves for this puzzle is twenty-two - eleven for the black and eleven for the white.

The pairs of numbers in the illustration make up the way how such a solution may be completed (based on the numeration of the board's squares shown in the illustration). Pairs in bold represent the moves for the black knights, the rest pairs - for the white knights, respectively. The first number in each pair indicates the initial square of the move and the second - the finish one of the same move.

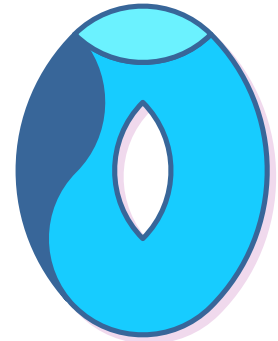
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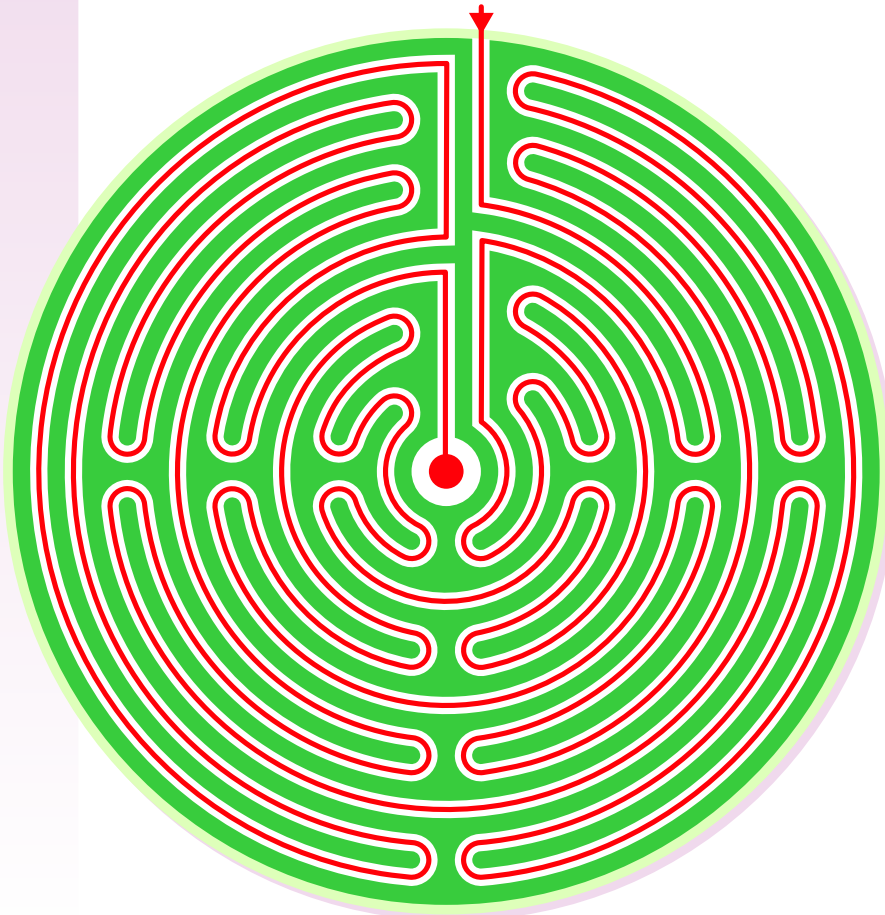
8-Piece Solution



6-Piece Solution

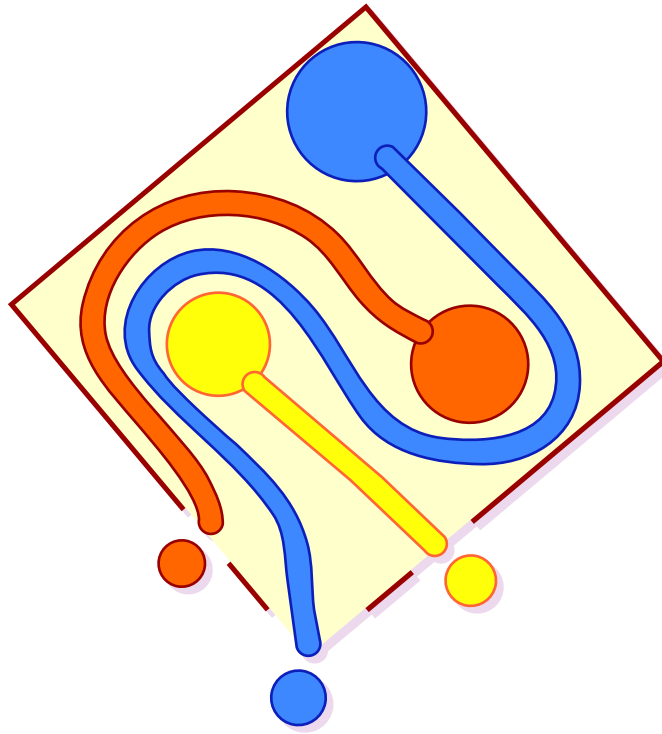
Disk in2 Ovals (solution)

The solutions of eight and six pieces are shown in the illustration.



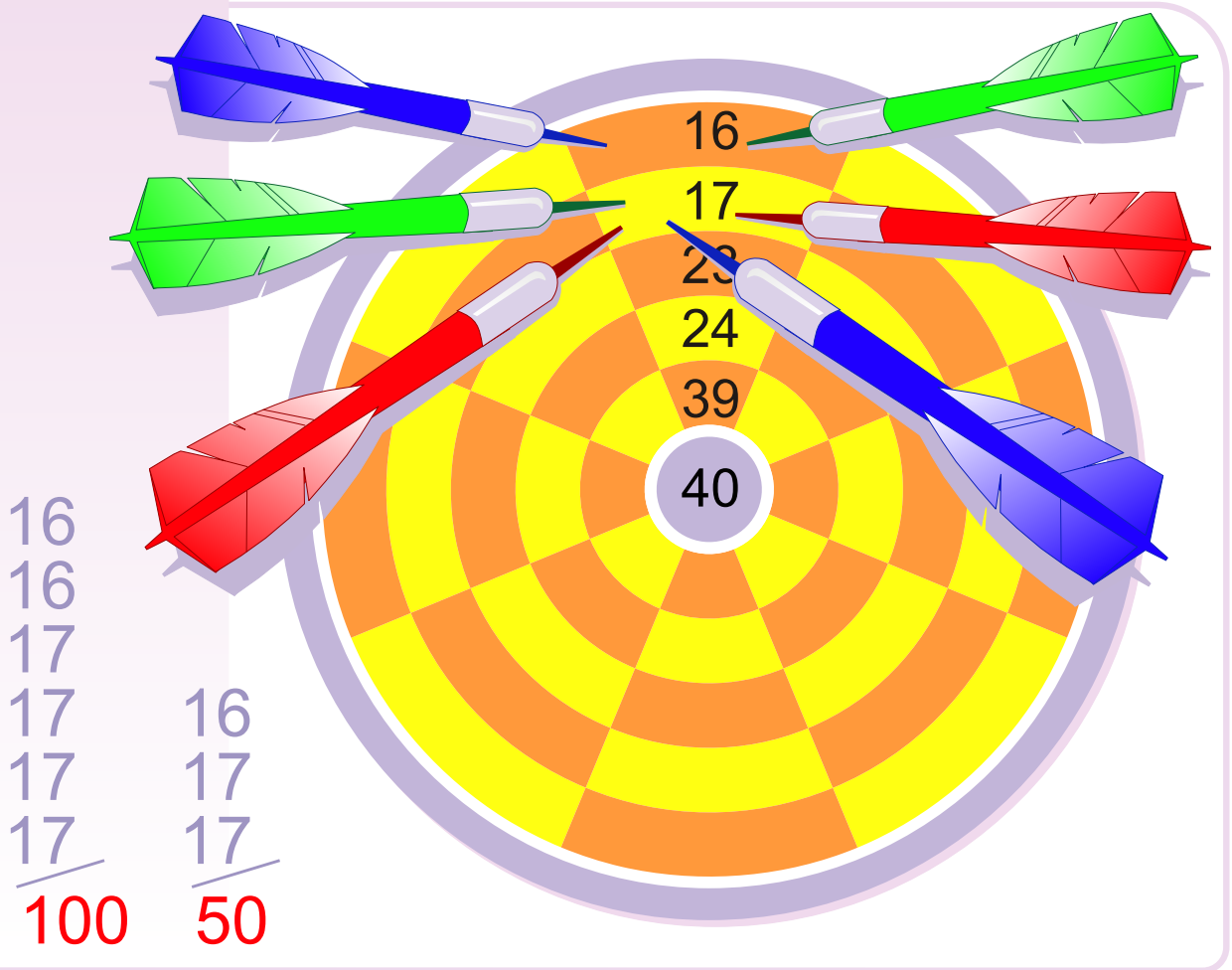
The Alkborough Maze (solution)

Since it is a unicursal maze there is only one path through it existing - just as shown in the illustration with the red line.



The Quarrelsome Neighbors (solution)

The quarrelsome neighbors have to build their paths as shown in the illustration or in the symmetric way.



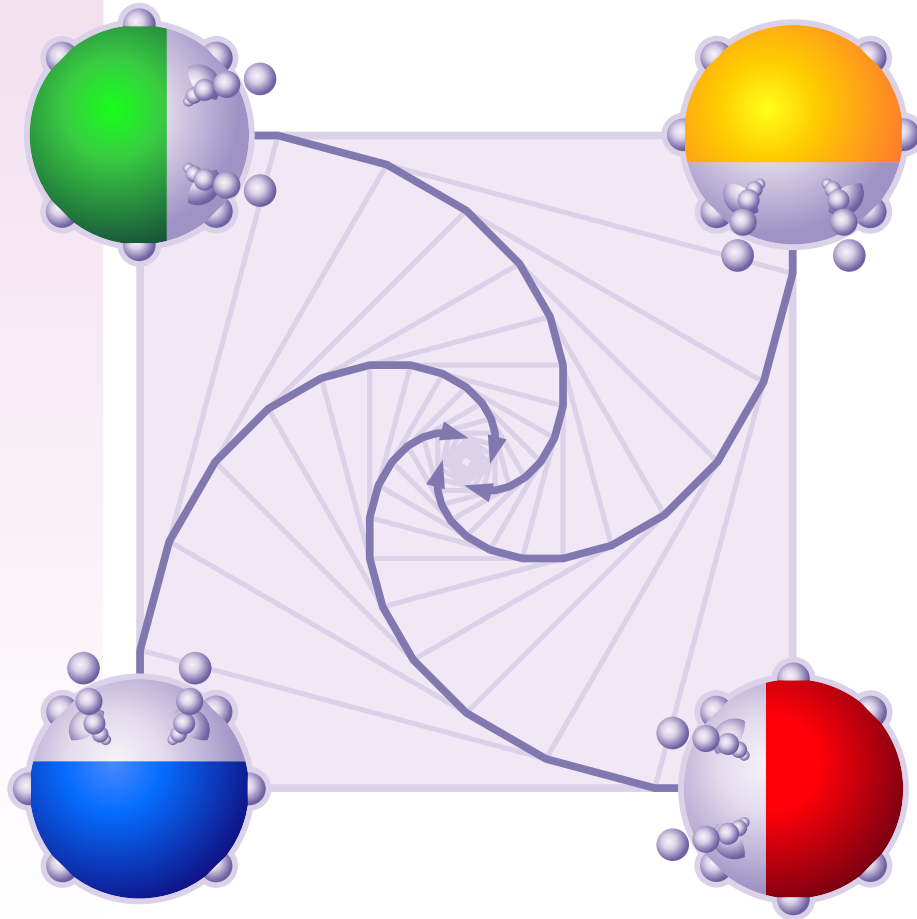
Darts Count (solution)

The only way to score 50 is to target the 17 ring twice and the 16 ring once. And the only way to score 100 is to score the 50 twice, i.e. to toss four darts on 17 and two on 16. This makes six darts in total.



Key Word (solution)

The four arrows point in the four main directions: North, East, West and South, starting with North on the left key in the row. If the four arrows are replaced with the initial letters of the respective directions the word NEWS appears - just as shown in the illustration.



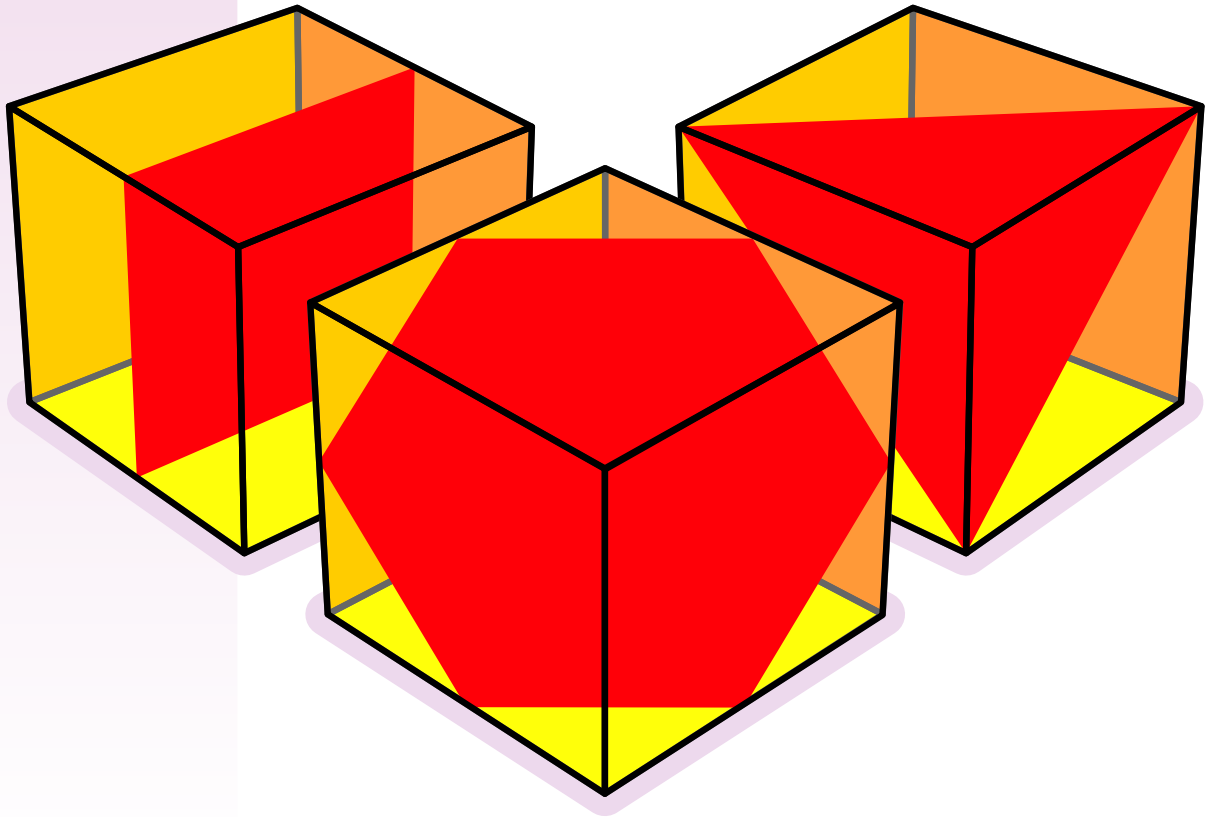
Bugs' Traffic (solution)

At any given instant the four bugs form the corners of a square which shrinks and rotates as the bugs move closer together (see the illustration). The path of each pursuer will therefore at all times be perpendicular to the path of the pursued. This tells us that as the Green bug, for example, approaches the Yellow one, there is no component in the Yellow bug's motion which carries the Yellow toward or away from the Green. Consequently the Green will capture the Yellow in the same time that it would take if the Yellow had remained stationary. The length of each spiral path will be the same as the side of the square: 10 units.

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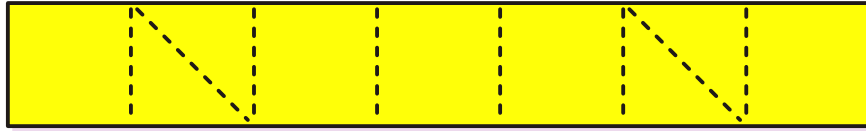
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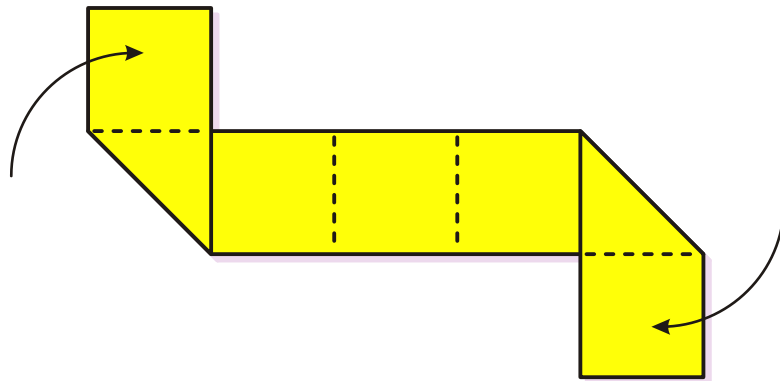
Hexagon Inside the Cube (solution)

A plane which passes through the midpoints of six sides of the cube as shown in the center of the illustration, produces a cross section that is a regular hexagon. Since the side of the cube is one unit, the side of the hexagon is square root of $1/2$.

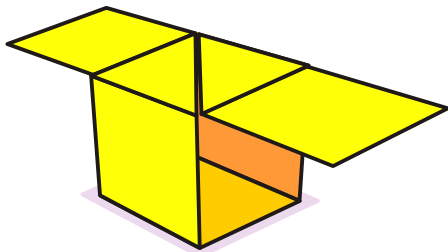
1



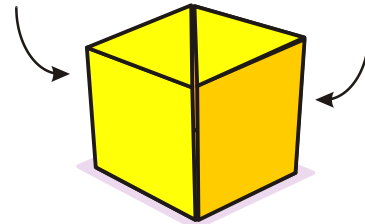
2



3



4

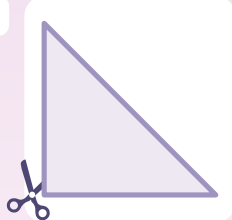


Strip to Cube (solution)

The entire folding is shown in the illustration.

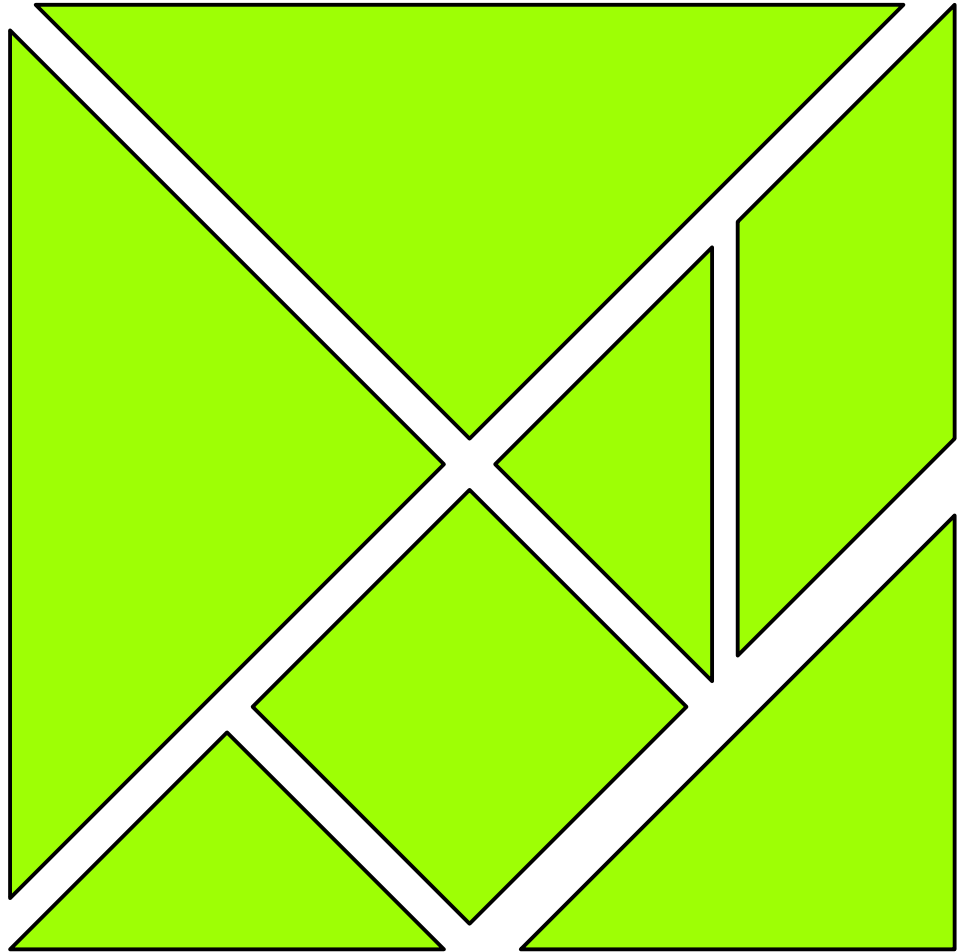
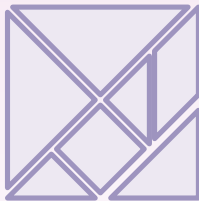
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Pieces & Boards

1



x 7

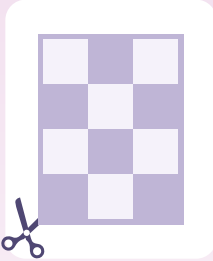
F



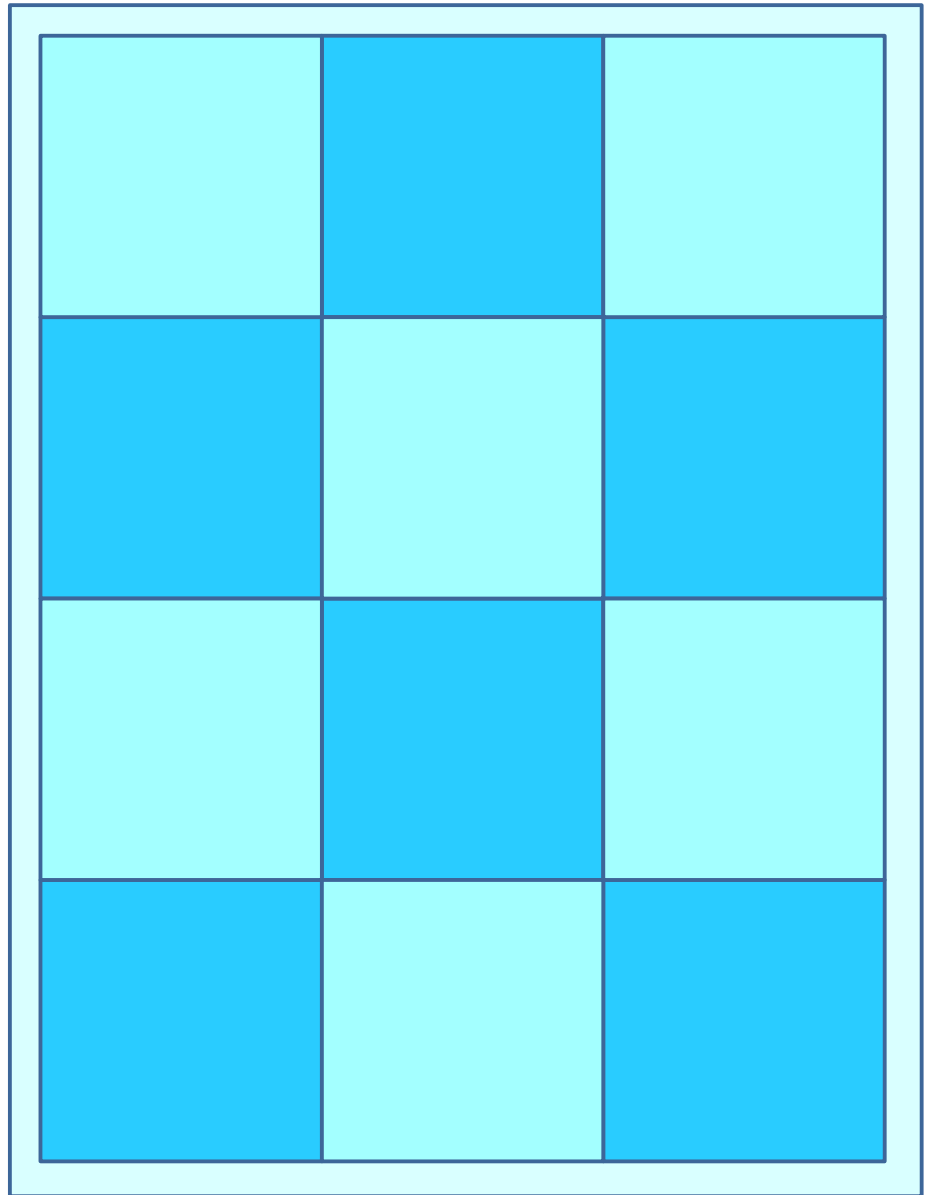
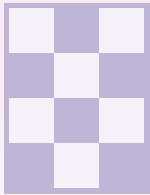
The Tangram (pieces)

To produce the pieces first print them out. Then follow the diagram shown in the left column above - from step 1 to step F (finish).

1



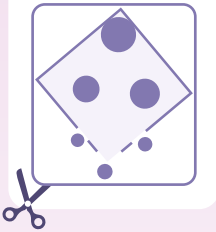
F



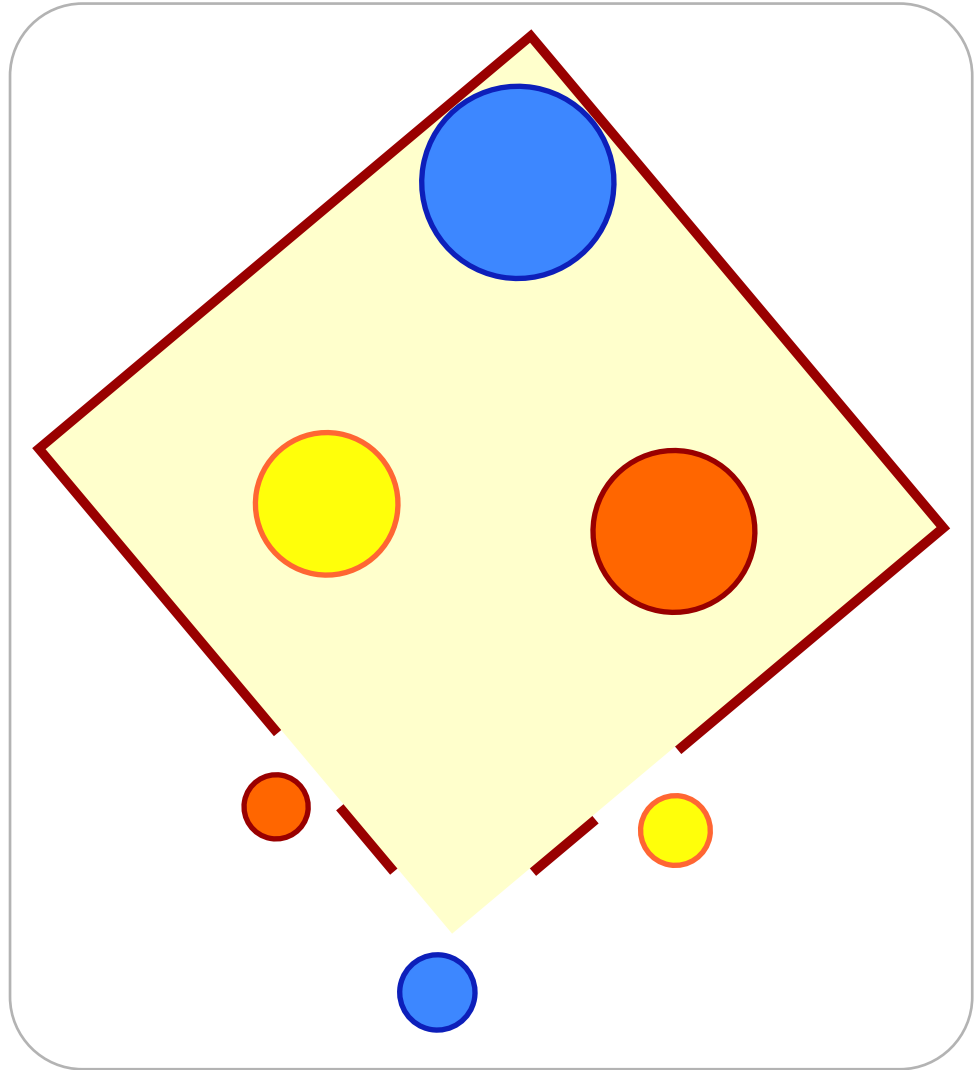
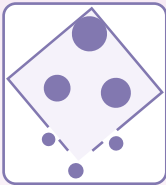
Six Knights (board)

To produce the board first print it out. Then follow the diagram shown in the left column above - from step 1 to step F (finish).

1



F



The Quarrelsome Neighbors (board)

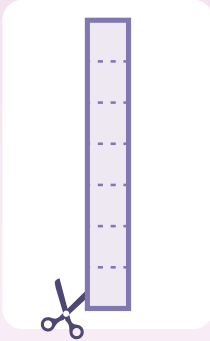
To produce the board first print it out. Then follow the diagram shown in the left column above - from step 1 to step F (finish).

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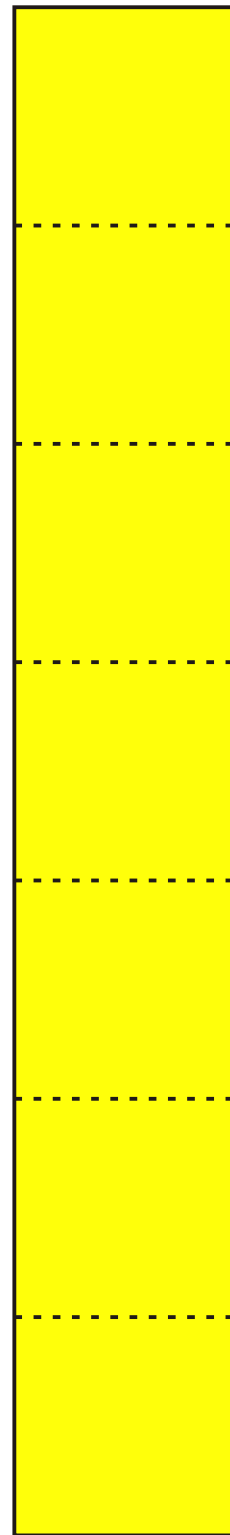
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1



F



Strip to Cube (pattern)

To produce the pattern first print it out. Then follow the diagram shown in the left column above - from step 1 to step F (finish).

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