1.

With the aim of promoting tourism, the county has chosen 32 interesting tourist routes. The first one is 1km long, the second is 2km long… and the 32nd is 32km long. The county wants its two electric vehicles to travel along all these interesting tourist routes. Each of the routes needs to be covered just once by either one of the two vehicles. Calculate the number of possible ways that this can be achieved if we want both vehicles to travel an equal amount of total kilometers on these roads?

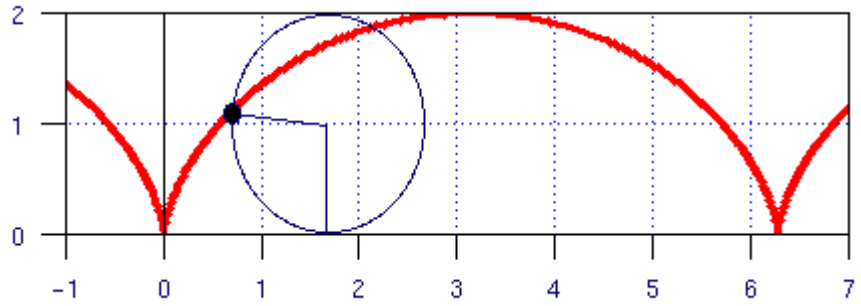
Example: if the county has only 7 tourist routes (with lengths of 1km, 2km… to 7km), vehicles A and B would be able to travel along them in 4 different ways if the vehicles travel the same total number of kilometers: A(1, 6, 7) B(2, 3, 4, 5); A(2, 5, 7) B(1, 3, 4, 6); A(3, 4, 7) B(1, 2, 5, 6); A(1, 2, 4, 7) B(3, 5, 6)

2.

In a square of size 4 x 4, odd numbers from 1 to 31 have to be entered. In how many ways is it possible to achieve this if the sums of all the rows and columns of the square are to be equal? (combinations that can be obtained by rotation or mirroring also count as different ways)

3.

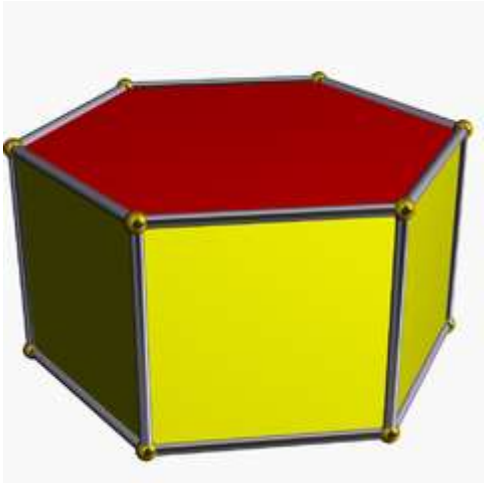
A wheel, with radius r, is on a horizontal surface. The point where the wheel is touching the surface is T. The wheel rotates without slipping a full turn, so point T is now touching the surface again. What is the length of the path that point T has travelled?



4.

A container has the shape of a regular vertical hexagonal prism.

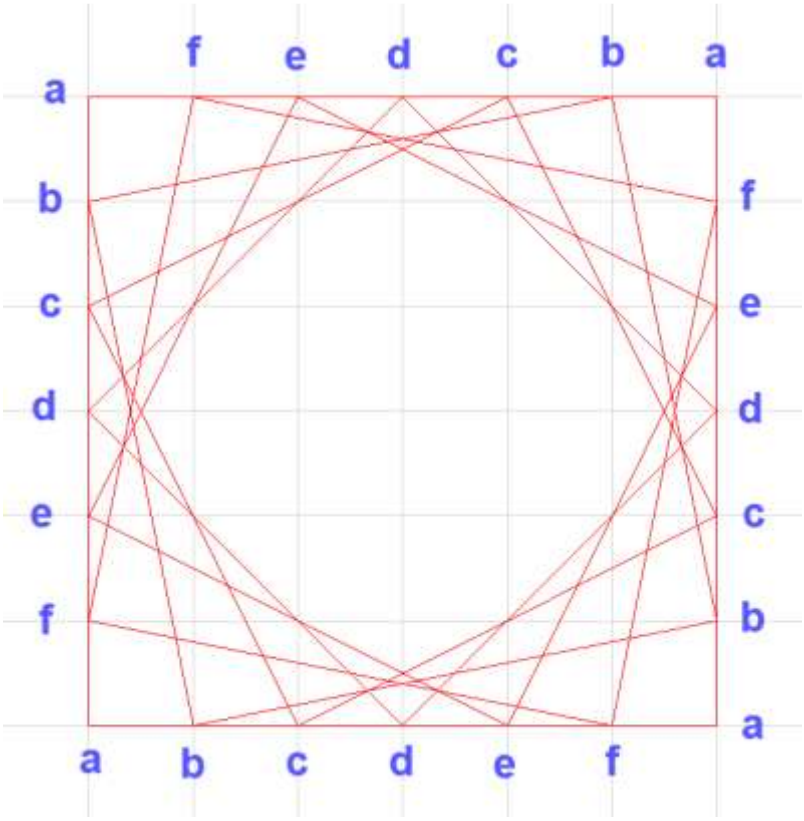
The base is a regular hexagon with side a = 5.58 cm and the container height h = 7.54 cm. Calculate the number of balls the container will hold if the ball diameter d = 1 cm.



5.

On a square are drawn additional lines that link adjacent sides (as shown in the diagram). Determine the surface area of the 'empty area' inside the square if the square has dimensions 32 x 32.

Example: For a square of size 6 x 6 are, the surface area of the central 'empty area' inside the square is 16.



6.

What is the angle of adjacent surfaces of a soccer ball, a body consisting of regular hexagons and pentagons (angle of hexagon to hexagon, and angle of pentagon to hexagon)?

7.

Inside a cube, in opposite corners, there is an ant and a blind spider. The ant is standing still, and the spider is moving randomly from corner to corner, using only edges. What is the expected number of travelled edges until the spider meets the ant?