

MY CONTRIBUTIONS TO MATHEMATICS

New concept in Combinatorial Geometry

- 1) Partitioning the set of vertices of a convex polygon into non-intersecting polygons.

Sequences published on Online Encyclopedia of Integer Sequences (OEIS)

- 2) A350116 – Number of ways to partition the set of vertices of a convex $(n + 8)$ – gon into 3 nonintersecting polygons.
- 3) A350248 – Triangle read by rows $T(n,k)$ is the number of non-crossing partitions of an n – set into k blocks of size 3 or more, $n \geq 0$, $0 \leq k \leq \text{floor}(n/3)$
- 4) A350286 – Number of different ways to partition the set of vertices of a convex $(n + 11)$ – gon into 4 nonintersecting polygons.
- 5) A350303 – Number of ways to partition the set of vertices of a convex $(n + 14)$ – gon into 5 nonintersecting polygons.
- 6) A350599 – Number of ways to partition the set of vertices of a convex n – gon into nonintersecting directed polygons.
- 7) A350640 – Minimum lcm of the part sizes of a partition of n into parts of size 3 or more.
- 8) A347862 – Total number of polygons left out in all partitions of the set of vertices of a convex n – gon into nonintersecting polygons.
- 9) A351103 – Total number of polygons left over with maximum number of sides when partitioning the set of vertices of a convex n – gon into nonintersecting polygons.
- 10) A352477 – Number of different ways to partition the set of vertices of a convex n – gon into 4 intersecting polygons.
- 11) A352474 – Number of different ways to partition the set of vertices of a convex n – gon into 3 intersecting polygons.
- 12) A352611 – Number of different ways to partition the set of vertices of a convex n – gon into 5 polygons.
- 13) A352900 – Number of different ways to partition the set of vertices of a convex n – gon into intersecting polygons.
- 14) A357603 – Number of different pairs of shortest paths in an $n \times n$ lattice going between opposite corners in opposite direction and not meeting at their middle point.
- 15) A357760 – Number of different pairs of shortest grid paths joining two opposite corners in opposite order in an $n \times n \times n$ grid with middle point on the paths as a common point.
- 16) A358481 – Number of different pairs of shortest grid paths joining two opposite corners in opposite order in an $n \times n \times n$ grid without having middle point on their paths as a common point.
- 17) A362207 – Number of unordered triples of shortest nonintersecting grid paths joining two opposite corners of an $n \times n \times n$ grid.
- 18) A360444 – Number of ways for two nonintersecting, unordered pairs of shortest grid paths to cross over between two opposite corners in an $n \times n$ grid without intersecting opposite paths at their middle points.

Mathematical Models and Computer Programs in Combinatorial Geometry

- 19) Mathematical Model of the sequence A360444.
- 20) Python Code of the Mathematical Model of A360444
- 21) Mathematical Model of ordered triplets (An open challenge to create a computer program and obtain integer outputs)

New proofs and totally different approaches in other fields of mathematics

- 22) Geometrical proof of the sum of infinite series $\cot^{-1} 3 + \cot^{-1} 7 + \cot^{-1} 13 + \dots$ converges to $\pi/4$.
- 23) Geometrical proof of the sum of infinite series $\cot^{-1} 2 + \cot^{-1} 8 + \cot^{-1} 18 + \dots$ converges to $\pi/4$.
- 24) Geometrical proof of the sum of infinite series $\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \dots$ converges to 1.
- 25) Geometrical proof of sum and the product of three tangents of a triangle are equal in the case of an obtuse-angled triangles.
- 26) The Inclusion-Exclusion Principle in geometrical approach of completing square in Quadratics.
- 27) Fully trigonometric proof of Pythagoras theorem without applying properties of similar triangles.
- 28) Simultaneous Single Proof of the Sine Law and Cosine Law.

21st Century Teaching and Learning Mathematics

- 29) Humanistic Mathematics Activity-Based Project.