References

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### Length (Curve)

Let $\gamma(t)$ be a smooth curve in a MANIFOLD $M$ from $x$ to $y$ with $\gamma(0)=x$ and $\gamma(1)=y$. Then $\gamma'(t) \in T_{\gamma(t)}$ where $T_x$ is the TANGENT SPACE of $M$ at $x$. The length of $\gamma$ with respect to the Riemannian structure is given by

$$\int_0^1 \|\gamma'(t)\|_{\gamma(t)}\, dt.$$

*See also* ARC LENGTH, DISTANCE

### Length (Number)

The length of a number $n$ in base $b$ is the number of DIGITS in the base-$b$ numeral for $n$, given by the formula

$$L(n, b) = \lfloor \log_b(n) \rfloor + 1,$$

where $\lfloor x \rfloor$ is the FLOOR FUNCTION.

The MULTIPLICATIVE PERSISTENCE of an $n$-DIGIT is sometimes also called its length.

*See also* CONCATENATION, DIGIT, FIGURES, MULTIPLICATIVE PERSISTENCE

### Length (Partial Order)

For a PARTIAL ORDER, the size of the longest CHAIN is called the length.

*See also* WIDTH (PARTIAL ORDER)

### Length (Size)

The longest dimension of a 3-D object.

*See also* HEIGHT, WIDTH (SIZE)

### Length Distribution Function

A function giving the distribution of the interpoint distances of a curve. It is defined by

$$p(r) = \frac{1}{N} \sum_{ij} \delta_{r_{ij}} = r.$$

*See also* RADIUS OF GYRATION


References

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### Length-Preserving Transformation

ISOMETRY

### Lengyel's Constant

*N.B. A detailed online essay by S. Finch was the starting point for this entry.*

Let $L$ denote the partition lattice of the SET $\{1, 2, \ldots, n\}$. The MAXIMUM element of $L$ is

$$M = \{\{1, 2, \ldots, n\}\} \tag{1}$$

and the MINIMUM element is

$$m = \{\{1\}, \{2\}, \ldots, \{n\}\}. \tag{2}$$

Let $Z_n$ denote the number of chains of any length in $L$ containing both $M$ and $m$. Then $Z_n$ satisfies the RECURRENCE RELATION

$$Z_n = \sum_{k=1}^{n-1} s(n, k) Z_k, \tag{3}$$

where $s(n, k)$ is a STIRLING NUMBER OF THE SECOND KIND. Lengyel (1984) proved that the QUOTIENT

$$r(n) = \frac{Z_n}{(n!)^2 (2 \ln 2)^{-n} n^{1-(\ln 2)/3}} \tag{4}$$

is bounded between two constants as $n \to \infty$, and Flajolet and Salvy (1990) improved the result of Babai and Lengyel (1992) to show that

$$\Lambda \equiv \lim_{n\to\infty} r(n) = 1.0986858055\ldots. \tag{5}$$


References

Babai, L. and Lengyel, T. "A Convergence Criterion for Recurrent Sequences with Application to the Partition Lattice." *Analysis* **12**, 109–19, 1992.

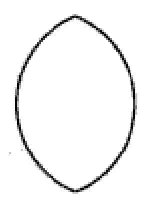
Finch, S. "Favorite Mathematical Constants." http://www.mathsoft.com/asolve/constant/lngy/lngy.html.

Flajolet, P. and Salvy, B. "Hierarchal Set Partitions and Analytic Iterates of the Exponential Function." Unpublished manuscript, 1990.

Lengyel, T. "On a Recurrence Involving Stirling Numbers." *Europ. J. Comb.* **5**, 313–21, 1984.

Plouffe, S. "The Lengyel Constant." http://www.lacim.uqam.ca/piDATA/lengyel.txt.


### Lens



A figure composed of two equal and symmetrically placed circular ARCS. It is also known as the FISH BLADDER (Pedoe 1995, p. xii) or VESICA PISCIS. The latter term is often used for the particular lens formed by the intersection of two unit CIRCLES whose