Fundamental Unimathematics (Universal Mathematics)
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In classical mathematics [1], division by zero is considered when unnecessary, ever brings insolvable problems, and is never efficiently utilized. The real numbers R evaluate no unbounded quantity and, because of gaps, not all bounded quantities. The same probability $p_n = p$ of the random sampling of a certain $n \in N = \{1, 2, 3, ...\}$ does not exist in R , since $\Sigma_{n\in N}\ p_n$ is either 0 for p = 0 or $+\infty$ for p > 0. The probabilities of many typical possible events vanish (e.g., that of the choice of a certain point on a segment of a straight line or curve), as if those were impossible events. There is no perfectly sensitive universal measure with conservation laws in the finite, infinite, and infinitesimal and even for sets with parts of different dimensions. The sets, fuzzy sets, multisets, and set operations express and form not all collections. Infinity is a heap of very different infinities the cardinality only can very roughly discriminate and no tool exactly measures. Operations are considered for natural numbers or countable sets of operands only. Concrete (mixed) physical magnitudes cannot be modeled because, e.g., by 5 liter fuel, there is no known operation unifying "5 L" and "fuel".

Fundamental universal mathematics [2-5] first explicitly directly used division by zero to further extend all the infinitesimal, finite, infinite, and combined pure (dimensionless) amounts and to conveniently operate on them with holding the conservation laws and introduced the emptying (voiding) operation transforming any object to the empty (void) object (element) # (or the empty set Ø so that # ∈ Ø and # = Ø). Using the empty (void) operand # (or Ø) excludes (drops) any operation on this operand so that this operand neutralizes any operation. Then the "result" of performing no operations at all (hence on no operands, arguments, or inputs) equals namely # (or Ø), which is universal. Further zero 0 may be considered to be nonnumber which does not belong to the natural numbers N, to the integer numbers Z, to the real numbers R, to the complex numbers C, etc. The uninumbers generalize the real numbers via including some infinite cardinal numbers (or their minimal ordinal numbers) among ω_0 , ω_1 , ω_2 , … [1] as canonic positive infinities (with signed reciprocals $\pm\theta_0 = \pm1/\omega_0$, $\pm\theta_1 = \pm1/\omega_1$, $\pm\theta_2 = \pm1/\omega_2$, …) and signed zeroes ±0 (with common modulus $\Theta = +0 = 0+ = |\pm0|$) reciprocals $\pm\Phi = \pm1/\Theta = \pm1/|0| = \pm1/|\pm0|$ as canonic overinfinities. Include, e.g., $\omega = \omega_0$ (the first Cantorian cardinal $\aleph_0$) and Ω = **C** (the continuum cardinality). Quantification builds algebraically quantioperable quantielements $_q a$ (e.g., $_{5\,L}$fuel) and quantisets $\{_{q(j)}a(j) \mid j \in J\}$ with any quantity $q(j) = q_j$ of each element $a(j) = a_j$ which both are any objects indexed via any (possibly uncountable) index set J. Quantiset uniquantities $Q = \Sigma_{j\in J}\ q_j$ are universal, perfectly sensitive, and even uncountably algebraically additive measures with universal conservation laws. Canonical sets interpret canonical positive infinities, e.g., via Q(N) = Q{n | n ∈ N = {1, 2, 3, …}} = ω and Q]0, 1] = Q{r | r ∈ R, 0 < r ≤ 1} = Ω (R the reals). In created uniarithmetics, quantialgebra, and quantianalysis of the finite, the infinite, and the overinfinite with quantioperations and quantirelations, the uninumbers evaluate, precisely measure, and are interpreted by quantielements and quantisets with uniquantities. Then, e.g., $Q\{a + bn \mid n \in N\} = \omega/|b| - a/b - 1/2 + 1/(2|b|)$, $Q]a\ , b[^n = ((b - a)\Omega - 1)^n$, and $Q(R^n) = 2^n\omega^n\Omega^n$ (a, b ∈ R). See a conditional finite scale of the uninumbers including zero, quasizeroes θ_n , infinitesimals, nonzero reals, infinities, and overinfinities (Figure 1) using interval (-5, 5) on the homogeneous s-axis:

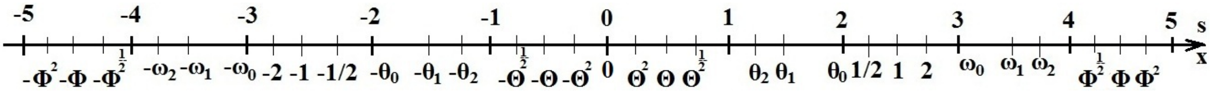

Figure 1. Conditional finite scale interpretation of the uninumbers x

Also see a conditional finite scale of the uninumbers including zero, infinitesimals, nonzero reals, and infinities (Fig. 2) using interval (-3, 3) on the homogeneous s-axis:

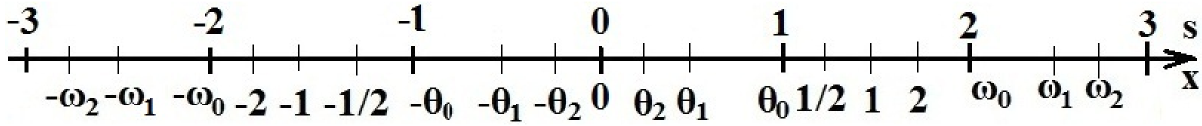

Figure 2. Conditional finite scale interpretation of uninumbers x including zero, infinitesimals, nonzero real numbers, and infinities

Fundamental unimathematics gives the above p = 1/Q(N) = 1/ω > 0 and creates fundamentally new tools for many earlier principally unsolvable urgent problems, e.g., in aeronautical fatigue, with discovering phenomena and laws of nature and science.

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[1] Encyclopaedia of Mathematics. Ed. Michiel Hazewinkel. Volumes 1 to 10. Supplements I to III. Kluwer Academic Publ., Dordrecht, 1987-2002
[2] Lev Gelimson. Quantianalysis: Uninumbers, Quantioperations, Quantisets, and Multiquantities (now Uniquantities). Abhandlungen der WIGB (Wissenschaftlichen Gesellschaft zu Berlin), 3 (2003), Berlin, 15-21
[3] Lev Gelimson. General Problem Theory. Abhandlungen der WIGB (Wissenschaftlichen Gesellschaft zu Berlin), 3 (2003), Berlin, 26-32
[4] Lev Gelimson. Elastic Mathematics. General Strength Theory. The "Collegium" All World Academy of Sciences Publishers, Munich, 2004
[5] Lev Gelimson. Providing Helicopter Fatigue Strength: Flight Conditions. In: Structural Integrity of Advanced Aircraft and Life Extension for Current Fleets – Lessons Learned in 50 Years After the Comet Accidents, Proceedings of the 23rd ICAF Symposium, Claudio Dalle Donne (Ed.), 2005, Hamburg, Vol. II, 405-416