

A romantic couple is shown in silhouette, kissing and embracing against a dramatic sky at sunset or sunrise. The sky is filled with clouds, with a warm orange glow from the low sun on the left side. The couple is positioned in the lower center of the frame, their forms dark against the lighter sky.

***DAVID  
HILBERT***

***MATHEMATICAL  
PROBLEMS***

***DAVID  
HILBERT***

A romantic couple is shown in silhouette, kissing and embracing against a dramatic sky at sunset or sunrise. The sky is filled with dark, textured clouds, with a bright orange and yellow glow from the sun low on the horizon. The couple is positioned in the lower center of the frame, their forms dark against the lighter sky.

***MATHEMATICAL  
PROBLEMS***

**David Hilbert**

# **Mathematical Problems**

EAN 8596547089292

DigiCat, 2022

Contact: [DigiCat@okpublishing.info](mailto:DigiCat@okpublishing.info)



# TABLE OF CONTENTS

Lecture delivered before the International Congress of Mathematicians at Paris in 1900

1. Cantor's problem of the cardinal number of the continuum
2. The compatibility of the arithmetical axioms
3. The equality of two volumes of two tetrahedra of equal bases and equal altitudes
4. Problem of the straight line as the shortest distance between two points
5. Lie's concept of a continuous group of transformations without the assumption of the differentiability of the functions defining the group
6. Mathematical treatment of the axioms of physics
7. Irrationality and transcendence of certain numbers
8. Problems of prime numbers
9. Proof of the most general law of reciprocity in any number field
10. Determination of the solvability of a diophantine equation
11. Quadratic forms with any algebraic numerical coefficients
12. Extension of Kroneker's theorem on abelian fields to any algebraic realm of rationality
13. Impossibility of the solution of the general equation of the 7-th degree by means of functions of only two arguments
14. Proof of the finiteness of certain complete systems of functions

- 15. Rigorous foundation of Schubert's enumerative calculus
- 16. Problem of the topology of algebraic curves and surfaces
- 17. Expression of definite forms by squares
- 18. Building up of space from congruent polyhedra
- 19. Are the solutions of regular problems in the calculus of variations always necessarily analytic?
- 20. The general problem of boundary values
- 21. Proof of the existence of linear differential equations having a prescribed monodromic group
- 22. Uniformization of analytic relations by means of automorphic functions
- 23. Further development of the methods of the calculus of variations



# **Mathematical Problems**

[Table of Contents](#)

## **Lecture delivered before the International Congress of Mathematicians at Paris in 1900**

[Table of Contents](#)

By Professor David Hilbert<sup>[1]</sup>

Who of us would not be glad to lift the veil behind which the future lies hidden; to cast a glance at the next advances of our science and at the secrets of its development during future centuries? What particular goals will there be toward which the leading mathematical spirits of coming generations will strive? What new methods and new facts in the wide and rich field of mathematical thought will the new centuries disclose?

History teaches the continuity of the development of science. We know that every age has its own problems, which the following age either solves or casts aside as profitless and replaces by new ones. If we would obtain an idea of the probable development of mathematical knowledge in the immediate future, we must let the

unsettled questions pass before our minds and look over the problems which the science of today sets and whose solution we expect from the future. To such a review of problems the present day, lying at the meeting of the centuries, seems to me well adapted. For the close of a great epoch not only invites us to look back into the past but also directs our thoughts to the unknown future.

The deep significance of certain problems for the advance of mathematical science in general and the important role which they play in the work of the individual investigator are not to be denied. As long as a branch of science offers an abundance of problems, so long is it alive; a lack of problems foreshadows extinction or the cessation of independent development. Just as every human undertaking pursues certain objects, so also mathematical research requires its problems. It is by the solution of problems that the investigator tests the temper of his steel; he finds new methods and new outlooks, and gains a wider and freer horizon.

It is difficult and often impossible to judge the value of a problem correctly in advance; for the final award depends upon the gain which science obtains from the problem. Nevertheless we can ask whether there are general criteria which mark a good mathematical problem. An old French mathematician said: "A mathematical theory is not to be considered complete until you have made it so clear that you can explain it to the first man whom you meet on the street." This clearness and ease of comprehension, here