

Math test : rules and procedures

Double degree admission. Telecom Paris & Sciences Po Paris

Fall 2026

1 Interview Objective

The scientific test consists of an oral exam with a minimum of *two unrelated questions*. The duration of the test is 45 minutes, which includes the candidate's welcoming, the identity verification, and the scientific discussion with the examiner.

During the test, the candidate may take a few minutes to reflect in silence and structure their answer. They may also ask the examiner for clarifications on the question or propose partial problem-solving approaches.

The candidate will have access to a shared document (in markdown format or as an electronic whiteboard) to present their calculations and reasoning. By default, calculators or any other computing devices are not allowed. However, the candidate may propose to the examiner to perform certain calculations or experiments using a computational algebra software, a scientific computing tool, or directly in a programming language. The use of a computer tool can only be at the candidate's initiative and, in such cases, the candidate is expected to explain their actions and can be asked to indicate how they could have worked without using a program.

The scientific test is graded out of 20 points. The grade is based on the rigor of the mathematical reasoning, the accuracy of the reasoning or of the calculations, and the quality of the dialogue with the examiner.

2 Practical Organization

The interview will be conducted remotely via a videoconferencing platform (using Zoom).

2.1 Before the interview

- Arrange a room that is a closed, empty and quiet location where you will not be disturbed (typically, a work capsule or room at your university).
- Prepare a computer with a keyboard, one screen (and only one), a microphone and a camera previously tested.
The Zoom client should be installed prior to the meeting.
- Make sure you have a robust Internet connexion.
- Prepare scratch paper (without marks on it), pens.
- Prepare a valid photo ID (ready on your desk)
- Bring a water bottle if needed.

Note that :

- The use of virtual machines, remote desktop connections, or multiple monitors is prohibited.
- The room should be void of any smartphones, smartwatches, smart-glasses, headphones, additional computers, calculators, textbooks, notes, or any electronic device not explicitly allowed.

2.2 At the beginning of the interview

- Connect to the link provided to you.
- Share your entire screen during the interview (not just the app you are using).
You should close any window not related to the examination. It is your responsibility to not expose any personal information that you want to keep private.
- You will be instructed to connect to a shared document (markdown file) by the examiner using your web browser.
- Present a valid photo ID (passport, student card, or national ID) to the examiner via the camera.
- Do a tour film of your room to demonstrate that you are working alone, without the help of written notes or any electronic device other than the computer you are using.

2.3 During the interview

Part of the interview may require the candidate to reflect in writing to note and structure their ideas or perform calculations.

- You may use scratch paper to conduct a calculation ;
- Report your results in the shared document and comment orally on the computation you have done.

2.4 Data Privacy

The interview shall not be recorded by either the candidate or the examiner. The shared documents must be destroyed at the end of the examination and cannot be used later by any jury.

3 Warnings

It is the candidate's responsibility to ensure they are in a closed and quiet location where they will not be disturbed (for example, they may use a study room at their university) and where they can speak freely. They must ensure a stable internet connection and work at a table cleared of any unauthorized objects for the exam. Technical issues are the candidate's responsibility. In case of disconnection, the candidate must reconnect quickly.

Throughout the interview, it is the candidate's responsibility to maintain an attitude and organization that demonstrates they are following these rules in good faith and are not attempting to cheat (wide-angle view to confirm no other objects are being handled, unobstructed face to show that there are no hidden headphones or smartglasses, etc.).

Any violation of or lack of cooperation to abide by the rules, including but not limited to the use of unauthorized materials, assistance from third parties, or technical tampering, will be reported to the admission committee.

4 Syllabus

General Algebra : Set theory reasoning and vocabulary. Complex numbers. Trigonometry. Elementary geometry of the plane and space. Arithmetic and factorization of polynomials. Partial fraction decomposition of a rational function.

Linear Algebra : Vector and matrix calculus, applications to systems of linear equations. Determinants. Real or complex vector spaces and linear applications, connection with matrix calculus. Euclidean and Hermitian spaces (including Gram-Schmidt method, reduction of symmetric endomorphisms). Bilinear algebra and quadratic forms (including symmetric, positive, or definite bilinear forms). Eigenvalues, eigenvectors, characteristic polynomial, diagonalization. Singular value decomposition.

Differential Calculus : Numerical sequences. Numerical series, including classical convergence criteria. Real functions of a real variable (continuity, differentiation, Taylor expansions, convexity). Linear differential equations of order 1 or 2. Special differential equations.

Integration and functional analysis : Classical integral calculus, including antiderivatives, change of variables, or integration by parts. Measure theory. Lebesgue integral. Convergence theorems. Multiple integrals and Fubini's theorem. Topology of normed vector spaces, L^p spaces, Riesz representation theorem.

Probability : Probability spaces. Conditional probability. Discrete random variables. Random variables with density relative to Lebesgue measure. Classical distributions (including : Bernoulli, uniform, binomial, geometric, Poisson, exponential, normal). Expectation. Moments. Classical inequalities. Random vectors.

Statistics : Law of large numbers, central limit theorem. Tests (including : Chi-square, Student's t-test, and Fisher's test).

Optimization : Multivariable functions, gradient, Hessian, Schwarz's theorem, convexity and its connection to minima. Unconstrained and constrained optimization, KKT theorem. Iterative resolution algorithms. Linear programming (including duality and complementary slackness theorem), simplex algorithm.