

Mathematics 1

Preparation and Review Guide

Mathematics 1 focuses mainly on **basic quantitative reasoning and mathematical problem solving**. Students should be comfortable using elementary mathematics flexibly, interpreting information correctly, and choosing an efficient method rather than relying only on memorised formulas.

1. **Arithmetic and number properties**

Review operations with integers, fractions and decimals, divisibility, factors and multiples, parity, signs, powers and roots, and basic numerical reasoning.

2. **Algebraic reasoning**

Be comfortable simplifying expressions, solving equations and inequalities, working with ratios and proportions, and translating verbal information into algebraic relationships.

3. **Percentages, rates and averages**

Review percentage calculations, proportional change, averages and weighted averages, and common rate problems involving quantities that change over time or are combined across groups.

4. **Sets and counting ideas**

Understand basic set relationships, unions and intersections, overlapping groups, and elementary counting arguments.

5. **Functions and graphs**

Review the basic meaning of a function, domain and range, intersections, simple transformations, absolute-value graphs, and the connection between algebraic expressions and their graphical representation.

6. **Coordinate geometry**

Be comfortable with points, lines, slope, distance, midpoint, and simple geometric reasoning in the coordinate plane.

7. **Elementary geometry**

Review basic properties of triangles, circles and polygons, including angle relationships, similarity, perimeter, area and standard right-triangle reasoning.

8. **Data interpretation and elementary probability**

Be able to read small tables and simple quantitative displays, compare values and percentages, and solve basic probability problems using clear counting and proportional reasoning.

General expectation. Preparation should emphasise clear reasoning, accurate algebra, interpretation of quantitative information, and the ability to combine several elementary ideas in a short problem.

Mathematics 2

Preparation and Review Guide

Mathematics 2 focuses more on **formal mathematical concepts and techniques** that are useful for graduate study in economics. Students should review the main ideas of single-variable calculus together with selected topics from functions, linear algebra, approximation and probability.

1. **Functions and inverse functions**
Review standard classes of functions, their domains and ranges, inverse relationships, transformations, and interpretation of graphs.
2. **Limits and continuity**
Understand the concept of a limit, one-sided behaviour, continuity, and how these ideas apply to functions given algebraically, graphically or piecewise.
3. **Differentiation**
Review the derivative as a rate of change and slope, together with the standard rules for differentiating elementary functions and functions defined in different forms.
4. **Applications of derivatives**
Be able to use derivatives to study the behaviour of functions, including monotonicity, extrema, tangent lines, concavity and related graphical information.
5. **Fundamental ideas of differential calculus**
Review the main conceptual results connecting continuity, differentiability and the behaviour of functions on intervals.
6. **Polynomial and rational functions**
Be comfortable analysing roots, intersections, critical behaviour and asymptotic properties of polynomial and rational functions.
7. **Accumulation and antiderivative intuition**
Understand the basic relationship between a function and its derivative, accumulated change, signed area, and the interpretation of an antiderivative.
8. **Matrices and determinants**
Review basic matrix operations and the main ideas involving determinants, rank, invertibility and small systems of linear relationships.
9. **Approximation of functions**
Understand the idea of approximating a smooth function near a point using simpler polynomial expressions and how local information about a function is used in such approximations.
10. **Elementary probability**
Review basic probability reasoning, including events described algebraically or geometrically and simple calculations involving random choices.

General expectation. Preparation should emphasise understanding definitions and relationships between concepts, recognising when a standard theorem or technique applies, and interpreting formulas and graphs rather than relying only on mechanical calculation.