Mathematics

GENERAL OBJECTIVES

The aim of the Unified Tertiary Matriculation Examination (UTME) syllabus in Mathematics is to prepare the candidates for the Board’s examination. It is designed to test the achievement of the course objectives, which are to:

(1) acquire computational and manipulative skills;
(2) develop precise, logical and formal reasoning skills;
(3) apply mathematical concepts to resolve issues in daily living;

This syllabus is divided into five sections:

I. Number and Numeration.
II. Algebra
III. Geometry/Trigonometry.
IV. Calculus
V. Statistics

DETAILED SYLLABUS

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<th>TOPICS/CONTENTS/NOTES</th>
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<tr>
<td>SECTION I: NUMBER AND NUMERATION.</td>
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<tr>
<td>1. Number bases:</td>
<td>Candidates should be able to:</td>
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<tr>
<td>(a) operations in different number bases from 2 to 10;</td>
<td>i. perform four basic operations (x, +, -, ÷);</td>
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<td>(b) conversion from one base to another including fractional parts.</td>
<td>ii. convert one base to another.</td>
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<td>2. Fractions, Decimals, Approximations and Percentages:</td>
<td>Candidates should be able to:</td>
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<tr>
<td>(a) fractions and decimals</td>
<td>i. perform basic operations (x, +, -, ÷) on fractions and decimals;</td>
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<tr>
<td>(b) significant figures</td>
<td>ii. express to specified number of significant figures and decimal places;</td>
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<td>(c) decimal places</td>
<td>iii. calculate simple interest, profit and loss per cent, ratio proportion and rate.</td>
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<td>(d) percentage errors</td>
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<td>(e) simple interest</td>
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<td>(f) profit and loss per cent</td>
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<tr>
<td>(g) ratio, proportion and rate</td>
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<td>3. Indices, Logarithms and Surds:</td>
<td>Candidates should be able to:</td>
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<td>(a) laws of indices</td>
<td>i. apply the laws of indices in calculation;</td>
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<td>(b) standard form</td>
<td>ii. establish the relationship between indices and logarithms in solving problems;</td>
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<td>(c) laws of logarithm</td>
<td>iii. solve problems in different bases in logarithms.</td>
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<td>(d) logarithm of any positive number to a given base.</td>
<td>iv. simplify and rationalize surds;</td>
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<td>(e) change of bases in logarithm and application.</td>
<td>v. perform basic operations on surds</td>
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### Mathematics

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<td>(f) relationship between indices and logarithm</td>
<td>Candidates should be able to:</td>
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<tr>
<td>(g) surds</td>
<td>i. identify types of sets, i.e. empty, universal, compliments, subsets, finite, infinite and disjoint sets;</td>
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<td><strong>4. Sets:</strong></td>
<td>ii. solve set problems using symbol;</td>
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<tr>
<td>(a) types of sets</td>
<td>iii. use venn diagrams to solve problems involving not more than 3 sets.</td>
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<tr>
<td>(b) algebra of sets</td>
<td></td>
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<tr>
<td>(c) venn diagrams and their applications.</td>
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**SECTION II: ALGEBRA**

1. **Polynomials:**
   (a) change of subject of formula
   (b) factor and remainder theorems
   (c) factorization of polynomials of degree not exceeding 3.
   (d) multiplication and division of polynomials
   (e) roots of polynomials not exceeding degree 3
   (f) simultaneous equations including one linear, one quadratic
   (g) graphs of polynomials of degree not greater than 3

2. **Variation:**
   (a) direct
   (b) inverse
   (c) joint
   (d) partial
   (e) percentage increase and decrease.

3. **Inequalities:**
   (a) analytical and graphical solutions of linear inequalities.
   (b) quadratic inequalities with integral roots only.

4. **Progression:**
   (a) nth term of a progression
   (b) sum of A. P. and G. P.

5. **Binary Operations:**
   (a) properties of closure, commutativity, associativity and distributivity.
   (b) identity and inverse elements.
### Mathematics

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| **6. Matrices and Determinants:**  
(a) algebra of matrices not exceeding $3 \times 3$.  
(b) determinants of matrices not exceeding $3 \times 3$.  
(c) inverses of $2 \times 2$ matrices  
[excluding quadratic and higher degree equations]. | Candidates should be able to:  
i. perform basic operations $(\times, +, -, \div)$ on matrices;  
ii. calculate determinants;  
iii. compute inverses of $2 \times 2$ matrices |
| **SECTION III: GEOMETRIC AND TRIGONOMETRY** | |
| **1. Euclidean Geometry:**  
(a) angles and lines  
(b) polygon; triangles, quadrilaterals and general polygon.  
(c) circles, angle properties, cyclic, quadrilaterals and intersecting chords.  
(d) construction. | Candidates should be able to:  
i. identify various types of lines and angles;  
ii. solve problems involving polygons;  
iii. calculate angles using circle theorems;  
iv. identify construction procedures of special angles, e.g. 30º, 45º, 60º, 75º, 90º etc. |
| **2. Mensuration:**  
(a) lengths and areas of plane geometrical figures.  
(b) lengths of arcs and chords of a circle.  
(c) areas of sectors and segments of circles.  
(d) surface areas and volumes of simple solids and composite figures.  
(e) the earth as a sphere, longitudes and latitudes | Candidates should be able to:  
i. calculate the perimeters and areas of triangles, quadrilaterals, circles and composite figures;  
ii. find the length of an arc, a chord and areas of sectors and segments of circles;  
iii. calculate total surface areas and volumes of cuboids, cylinders, cones, pyramids, prisms, sphere and composite figures;  
iv. determine the distance between two points on the earth’s surface. |
| **3. Loci:**  
locus in 2 dimensions based on geometric principles relating to lines and curves. | Candidates should be able to:  
identify and interpret loci relating to parallel lines, perpendicular bisectors, angle bisectors and circles. |
| **4. Coordinate Geometry:**  
(a) midpoint and gradient of a line segment.  
(b) distance between two points.  
(c) parallel and perpendicular lines  
(d) equations of straight lines. | Candidates should be able to:  
i. determine the midpoint and gradient of a line segment;  
ii. find distance between two points;  
iii. identify conditions for parallelism and perpendicularity;  
iv. find the equation of a line in the two-point form, point-slope form, slope intercept form and the general form. |
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<td><strong>5. Trigonometry:</strong></td>
<td>Candidates should be able to:</td>
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<td>(a) trigonometric ratios of angels.</td>
<td>i. calculate the sine, cosine and tangent of angles between (-360^\circ \leq 0 \leq 360^\circ);</td>
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<td>(b) angles of elevation and depression and bearing.</td>
<td>ii. apply these special angles, e.g. 30(^\circ), 45(^\circ), 60(^\circ), 75(^\circ), 90(^\circ), 135(^\circ) to solve simple problems in trigonometry;</td>
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<tr>
<td>(c) areas and solutions of triangle</td>
<td>iii. solve problems involving angles of elevation and depression and bearing;</td>
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<tr>
<td>(d) graphs of sine and cosine</td>
<td>iv. apply trigonometric formulae to find areas of triangles;</td>
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<tr>
<td>(e) sine and cosine formulae.</td>
<td>v. solve problems involving sine and cosine graphs.</td>
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**SECTION IV: CALCULUS**

1. **Differentiation:**
   (a) limit of a function;
   (b) differentiation of explicit algebraic and simple trigonometric functions – sine, cosine and tangent.

2. **Application of differentiation:**
   (a) rate of change
   (b) maxima and minima

3. **Integration:**
   (a) integration of explicit algebraic and simple trigonometric functions.
   (a) area under the curve.

**SECTION V: STATISTICS**

1. **Representation of data:**
   (a) frequency distribution
   (b) histogram, bar chart and pie chart.

2. **Measures of Location:**
   (a) mean, mode and median of ungrouped and grouped data – (simple cases only)
   (b) cumulative frequency
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<td><strong>3. Measures of Dispersion:</strong> range, mean deviation, variance and standard deviation.</td>
<td>Candidates should be able to: calculate the range, mean deviation, variance and standard deviation of ungrouped and group data.</td>
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<tr>
<td><strong>4. Permutation and Combination</strong></td>
<td>Candidates should be able to: solve simple problems involving permutation and combination.</td>
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<tr>
<td><strong>5. Probability</strong></td>
<td>Candidates should be able to: solve simple problems in probability (including addition and multiplication).</td>
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Mathematics

RECOMMENDED TEXTS


Tutuh – Adegun M. R. name(s)? (1997). Further Mathematics Project Books 1 to 3, Ibadan: NPS Educational