Department of Minerals and Energy
Mine Health and Safety
The Mine Surveyor's Certificate of Competency examinations

MATHEMATICS SYLLABUS

Framed in accordance with Regulation 28.6 in force in terms of Schedule 4 of the Mine Health and Safety Act (Act 29 of 1996) as amended

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ARITHMETIC AND ALGEBRA:

Fundamental principles, simplifications of fractions, partial fractions, factorisation, simultaneous linear and quadratic equations, graphical solution of equations, arithmetic and geometric progressions, logarithms, indices, surds, logarithmic and indicial equations. Graphs of straight lines, parabolas, circles and curves, Linear programming, permutations and combinations, binomial expansions, radian measure and angular velocity. Determinants (only up to third order)

GEOMETRY:

- **Plane Geometry**: Fundamental principles, properties of the straight line, relationship between the sides and angles of any type of triangle, congruent, similar and angles of any type of triangle, congruent, similar and isosceles triangles, parallelograms, similarity of rectilinear figures, equivalent areas, theorems on triangles, theorems on circles (centres, chord, tangents, secants, contacts of circles, sectorial and segmental angles), circumscribed, inscribed and escribed circles, ratios and inequalities.

- **Co-ordinate Geometry:** Its application to the solution of survey problems. Straight line equations, distance between two points, proportional subdivision of a straight line, parallelism, perpendicularly, angle of intersection between two straight lines, transformation of co-ordinates, changing of origin and/or changing of axes and areas of rectilinear figures from co-ordinates.

- **Three Dimensional Geometry**: Fundamental principles, relationship between points and lines in different planes, the angle between two planes and problems on dip and strike of strata.

TRIGONOMETRY:

Measurement of angles. Definition of, and relation between, trigonometrical ratios for angles of any magnitude. Expression of the ratios of all angles in terms of angles less than 90 degrees, relations between sides and angles. Multiple and sub-multiple angles. Sums to products and vice versa. Geometrical proofs of trigonometrical identities. Plotting of graphs of the trigonometrical ratios. Functions of compound angles. Proofs of, and problems on, identities.

Circular measure of angles. Sine and tangent of a small angle. Problems on true and apparent dips as applied to mine surveying. Solution of triangles. Calculation of heights and distances.

INTRODUCTION TO CALCULUS:

Differentiation:

- Limits and limiting functions.
- Proof of general formula from first principles.
- Sums, differences, products and quotients.
- Function of a function.
- Turning points and gradients.
- Differentiating linear, quadratic and cubic equations.
- Second derivatives.
- Basic problems on gradients, velocity and acceleration.
- Solution of simultaneous, linear and quadratic equations, points of intersection and gradients.
- Distinguish between maxima and minima. Point of inflexion.
- Integration: Simple integration to show that it is the reverse of differentiation