Math Department

Year of 2026-2027

Lessons required for the Math Entrance Exam:(Grade 10ADP to 11ADP) (Algebra 2)

*Calculator is needed. Word Problems are required.

1. **Complex Numbers**

   Students should be able to:

   - Perform operations with pure imaginary and complex numbers.

2. **Relations and Functions**

   Students should be able to:

   - Identify and classify linear and non-linear functions from equations, graphs and tables.
   - Find the domain, codomain and range of functions and write them in set-builder and interval notations.
   - Analyze the graphs of different types of functions: elements of symmetry (point/line), intercepts, extrema and end-behavior, approximate zeroes.
   - Study whether functions are one-to-one and/or onto.
   - Study the continuity and parity of functions graphically and algebraically.
   - Graph and analyze functions (linear, piecewise, step, absolute value, quadratic, power, polynomial, reciprocal, rational, square root, cube root) by using key features and table of values.
   - Apply transformations and compositions of transformations to the graphs of different types of functions and use transformations to write equations from graphs.

3. **Linear Equations, Inequalities and Systems**

Students should be able to:

- Write linear equations in standard form, slope-intercept form and point slope form and convert from one form to another.
- Graph and solve linear inequalities in two variables
- Solve linear and absolute value equations and inequalities algebraically and graphically.
- Solve systems of inequalities in two variables.
- Find and interpret the average rate of change of quadratic functions given as expressions, tables, and graphs.
- Write and solve a system of two equations in two variables (including systems of linear-quadratic and quadratic-quadratic equations) algebraically (substitution and elimination methods) and by graphing.

4. **Quadratic Functions**

Students should be able to:

- Graph quadratic functions.
- Find and interpret the average rate of change from an equation, a table and a graph.
- Solve quadratic equations by graphing.
- Use the discriminant to identify and find real and complex roots of a quadratic equation.
- Solve a quadratic equation by factoring, completing the square and by using the quadratic formula (real and complex roots).
- Complete the square in a quadratic function to interpret key features of its graph.
- Solve quadratic inequalities algebraically and graphically.

5. **Polynomials and Polynomial Functions**

Students should be able to:

- Graph and analyze (end-behavior and degree) of a power function.
- Graph and analyze (degree and leading coefficients, zeros, extrema and end-behavior) a polynomial function.
- Perform operations with polynomials including using synthetic division/long division
- Expand powers of binomials by using Pascal's Triangle and the Binomial Theorem.
- Prove polynomial identities and use them to describe numerical relationships.
- Evaluate functions by using synthetic substitution.
- Solve polynomial equations and inequalities in two variables by graphing.
- Determine the numbers and types of roots of polynomial equations, find zeros, and use zeros to graph polynomial functions.

6. **Rational Expressions and Functions**

Students should be able to:

- Simplify rational expressions and perform operations with them.
- Simplify complex fractions.
- Solve rational equations and inequalities in one variable algebraically.
- Find the asymptotes of a rational function.

7. **Radical Expressions and Functions**

Students should be able to:

- Simplify expressions involving radicals and rational exponents.
- Perform operations with radical expressions including rationalizing the denominator.
- Solve radical equations in one variable algebraically and graphically and identify extraneous solutions.

8. **Inverse Relations**

Students should be able to:

- Perform operations on functions (addition, subtraction, multiplication, division, composition)
- Find inverse of relations.
- Verify that two relations are inverses by using compositions.

9. **Trigonometric Functions**

Students should be able to:

- Find values of trigonometric functions for angles using trigonometric ratios in a right triangle and find missing angles and lengths.
- Find values of trigonometric functions given a point on a unit circle or the measure of a special angle.