



UNIVERSAL COLLEGE - ALEY



Growing Stronger



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Going Further Together

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MATH DEPARTMENT

Year of 2025-2026

Lessons required for the Math Entrance Exam: (Grade 9Bac to 10Bac)

1) Real Numbers:

Students should be able to:

- Classify numbers as natural, integers, rational, irrational and real.
- Simplify radicals.
- Compare two real numbers.
- Rationalize the denominator.

2) Algebraic Expressions:

Students should be able to:

- Determine the degree of a polynomial.
- Add, subtract and multiply polynomials.
- Expand, reduce and arrange a polynomial.
- Factorize a polynomial using greatest common factor, grouping and remarkable identities $((a + b)^2, (a - b)^2$ and $a^2 - b^2$).
- Find the roots of a polynomial.
- Simplify rational algebraic expressions.
- Solve equations in the form of $\frac{p(x)}{q(x)} = 0$ where $p(x)$ and $q(x)$ are two polynomials.

3) Proportionality:

Students should be able to:

- Identify directly and inversely proportional quantities.
- Calculate the fourth proportional of three numbers in proportional series.
- Calculate quantities after raise/discount based on a percentage of increase/decrease.

4) **Lines and circles:**

Students should be able to:

- a. Determine the relative position of a straight line and a circle.
- b. Determine the relative position of two circles knowing their radii and the distance between their centers.
- c. Determine the relation between the distance of the centers of the two circles and the sum or difference of their radii, knowing the relative position of the two circles.
- d. Draw a tangent to a circle from a point on it and use the property that this tangent is perpendicular to the radius at the point of tangency.
- e. Draw 2 tangents to a circle from a point outside it and use the property that the segments from this point to the points of tangency are equal.
- f. Use the property that the line of centers of the two circles is an axis of symmetry of the figure.

5) **Thales' properties:**

Students should be able to:

- a. Use Thales' properties in a triangle.
- b. Use the converse of Thales' theorem in a triangle.

6) **Lines in a coordinate system:**

Students should be able to:

- a. Plot a point in a coordinate system.
- b. Draw a line in a plane knowing its equation.
- c. Find an equation of a line passing through 2 given points as well as a vertical line passing through a given point, a horizontal line passing through a given point and a line passing through the origin.
- d. Determine whether a point, knowing its coordinates, belongs to a line of a given equation.
- e. Determine the coordinates of a point that belongs to a given line.
- f. Find the slope of a line.
- g. Identify that two lines are parallel when their slopes are equal.
- h. Identify that two lines are perpendicular when the product of their slopes is equal to -1.
- i. Determine an equation of a line passing through a given point and parallel/perpendicular to a given line.
- j. Calculate the distance between two points knowing their coordinates.

7) **Similar Triangles:**

Students should be able to:

- a. Use one of the three cases to prove similarity.
- b. Use similar triangles to find some relations concerning distance and length.

8) Trigonometry:

Students should be able to:

- a. Calculate the trigonometric functions of an angle.
- b. Find in degrees the measure of an angle using the slope of a line.
- c. Calculate sides of a triangle when given a cosine or sine of an angle.

9) Inequalities:

Students should be able to:

- a. Solve a linear inequality in one unknown.
- b. Represent the solution on a number line.

10) Vectors:

Students should be able to:

- a. Identify a vector by its direction, sense and magnitude.
- b. Recognize the geometrical representation of a vector.
- c. Define a direction, a sense and a magnitude of a vector.
- d. Use Chasles' relation in sum of vectors.