High School Department

174TH EXAMINATION

ADVANCED ALGEBRA

Tuesday, June 17, 1902 — 9.15 a. m. to 12.15 p. m., only

Answer eight questions but **no more.** *If more than eight are answered only the first eight answers will be considered. Give each step of solution. Reduce fractions to lowest terms. Express final result in its simplest form and mark it Ans. Each complete answer will receive 12½ credits. Papers entitled to 75 or more credits will be accepted.*

1 Define cologarithm, divergent series, combinations, reciprocal equations, derived polynomial.

2 Prove by a general method that if four quantities are in proportion, they will be in proportion by (*a*) inversion, (*b*) composition, (*c*) alternation.

3 Solve as a quadratic $3x^2 + 15x + 1 - 2\sqrt{x^2 + 5x + 1} = 3$

4 Given $\log 2 = .3010$, $\log 18 = 1.2553$; find $\log 3$, $\log 450$, $\log \frac{1}{12}$, $\log 18\frac{3}{4}$.

5 Solve $ax^2 + bx + c = 0$. State the conditions under which the roots will be (*a*) real and equal, (*b*) rational and unequal, (*c*) imaginary and unequal.

6 Solve $x^5 - 4x^4 - 10x^3 + 40x^2 + 9x - 36 = 0$

7 Find the square root of $2m - 2\sqrt{m^2 - n^3}$

8 Expand $\sqrt{1 - 3x + 2x^2}$ to *four* terms by the method of undetermined coefficients.

9 Derive the formula for the number of permutations of *n* different things taken *r* at a time.

10 Transform $x^3 + 6x^2 - 4x + 5 = 0$ into an equation whose second term is wanting.

11 Find by the method of differences the sum of 12 terms of the series $-3, 4, 14, 27$ etc.

12 Prove that if *a* is a root of the general equation of the nth degree, the first member of the equation is divisible by $x - a$.