University of the State of New York

High School Department

ADVANCED ALGEBRA

Tuesday, January 26, 1904—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 all operations (except mental ones) necessary to find results. Reduce each result to 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 detached coefficient, derived polynomial, logarithm, commensurable root, recurring series.

2 Solve as a quadratic $\sqrt{x^2-10x+46}+(x-5)^2=9$

3 Expand $(x+1)^{\frac{3}{2}}$ to *four* terms by the method of undetermined coefficients.

4 B travels 3 miles the first day, 7 miles the second day, 11 miles the third day etc.; in how many days will B overtake A who started from the same point 8 days in advance and who travels uniformly 15 miles a day?

5 Form an equation of the fourth degree with rational coefficients, one of whose roots is $\sqrt{3}+\sqrt{-2}$

6 Assuming that $a:b::b:c::c:d$, prove that $a:d::a^3:b^3$

7 Express $\frac{1}{2+}\ \frac{1}{1+}\ \frac{1}{1+}\ \frac{1}{1+}\ \frac{1}{2+}\ \frac{1}{8}$ as a common fraction and find the fifth convergent.

8 Derive a formula for finding (*a*) the number of permutations of n quantities taken r at a time, (*b*) the number of combinations of n quantities taken r at a time.

9 Transform the following equation into one whose coefficients are integral, that of the first term being unity:

$$2x^3+2\tfrac{1}{6}x^2+\tfrac{1}{8}x-\tfrac{1}{12}=0.$$

10 Given the inequality $x-z<y$, the terms x, y and z being positive; show the effect of multiplying the inequality by a, by $-a$; of changing the signs of all the terms; of transposing z.

11 Given $\log\tfrac{1}{2}=\overline{1}.6990$; solve by use of logarithms $8^{x+3}=5^{2x-1}$

12 Using Horner's method of approximation, compute to *three* places of decimals the root of $x^3+2x^2-23x-70=0$, that lies between 5 and 6.