

## High School Department

159TH EXAMINATION

## ADVANCED ALGEBRA

Tuesday, June 13, 1899—9.15 a. m. to 12.15 p. m., only

Answer 10 questions but no more. If more than 10 are answered only the first 10 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 10 credits. Papers entitled to 75 or more credits will be accepted.

1 Define five of the following: characteristic, conjugate imaginaries, continued proportion, arithmetic mean, convergent series, exponential equation, multiple root.

2 Simplify  $\left(\frac{a^{\frac{1}{2}}\sqrt{b^2}}{b\sqrt[3]{a^2}} \div \sqrt{\frac{a\sqrt{b^4}}{b\sqrt{a^2}}}\right)^6 \cdot \left(\frac{y^3}{x^{\frac{1}{2}}x^{-1}}\right)^{-\frac{2}{3}} \left(\frac{y^{\frac{1}{2}}x^{-1}}{x^{-\frac{2}{3}}}\right)^{\frac{2}{3}}$

3 Extract the square root of  $x^3 - 2y\sqrt{x^2 - y^2}$

4 Solve  $x^{\frac{2}{n}} - 5x^{\frac{1}{n}} + 6 = 0$

5 Interpret the forms  $\frac{a}{0}$ ,  $\frac{0}{\infty}$ ,  $\frac{0}{0}$

6 A boatman rows 21 miles down stream and back in 8 hours; he finds he can row 7 miles with the stream in the same time that he can row 5 miles against it. Find the time of rowing each way and the rate of the stream.

7 How many different numbers of 6 different figures each can be formed with the digits 1, 2, 3, 4, 5, 6, 7, 8, 9?

8 Find the sum of the series 3, -6, 12, -24, . . . to 9 terms. Derive the formula for obtaining this sum.

9 Find by the binomial theorem the value of  $\sqrt[4]{15}$  to four decimal places.

10 Express .37 as a continued fraction and find the fourth convergent.

11 Expand  $\sqrt{1-3x}$  to four terms by the method of undetermined coefficients.

12 Revert to four terms  $y = x - x^2 + x^3 - x^4 + \dots$

13 Derive the formula for the logarithm of (a) a quotient, (b) a root.

14 Given  $\log 2 = .3010$ ,  $\log 3 = .4771$ ,  $\log 7 = .8451$ ; find  $\log \frac{6\sqrt[4]{7}}{5^{\frac{1}{2}}}$ . Given  $12^n = 35$ ; find the value of  $x$ .

15 Transform  $x^4 - \frac{4x^3}{3} + \frac{5x}{81} - \frac{x}{27} = 0$  into an equation whose coefficients are integral, that of the first term being unity.