

High School Department

157TH EXAMINATION

ALGEBRA

Monday, January 23, 1899—9.15 a. m. to 12.15 p. m., only

Answer the first five questions and five of the others but no more. If more than five of the others are answered only the first five 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 Simplify
$$\frac{\frac{a^4 - 2a^3b + b^4}{a^3b + ab^3} \div \frac{a^2 - b^2}{a^2 + b^2}}{\frac{a^2 - b^2}{4a^2b^2}}$$

2 Simplify $3a - \{5a - [4a - (b - a)] - b\} - (-a - 3b)$

3 Solve $\frac{a^2c}{b} + x^2 = (a + x)(b + x) - a(b + c)$

4 Solve $\frac{6}{x+1} + \frac{2}{x} = 3$

5 Factor $3x^3 + xy - 2y^2$, $1 + x^{2n}$, $a^2 - 1$, $x^2 + 4ax + 4a^2 - b^2$,
 $x^{m+1} + x^m y + x y^m + y^{m+1}$

6 Define five of the following: factor, index, trinomial, degree of a term, simultaneous equations, involution, affected quadratic, radical.

7 Write out by the binomial theorem the first five terms of $(2a - \frac{b^2}{3})^5$

8 Find the square root of $x^4 - 2x^2 - x^4 + 3x^2 + 2x + 1$

9 A boy is 5 years older than his sister and $\frac{1}{4}$ as old as his father; the sum of the ages of all three is 51. Find the age of the father.

10 Find the greatest common divisor (highest common factor) of $4x^3 - 4x^2 - 9x + 5$ and $6x^4 - 5x^3 - 10x^2 + 3x - 10$

11 Simplify $\left(\frac{x+1}{x-1}\sqrt{\frac{x-1}{x+1}}\right)(\sqrt{x^2-1})$, $\frac{(\sqrt[3]{a}\sqrt[3]{b^2})^3}{\sqrt[3]{c^2}} \div \frac{\sqrt[3]{c^2b^3}}{\sqrt[3]{a^3}}$

12 Solve $\sqrt{x+a} + \sqrt{x} + \sqrt{x-a} = 0$

13 Solve $\begin{cases} x - y = 2 \\ x^2 y - xy^2 = 30 \end{cases}$

14 Find two consecutive numbers whose product is 306.

15 Find the cube root of $x^3 + 6x^2 - 40x^2 + 96x - 64$