High School Department

170TH EXAMINATION

ALGEBRA

August 1901 — Three hours, only

***Answer the first four questions and four of the others but* no more.** *If more than four of the others are answered only the first four answers will be considered. Division of groups is not allowed. 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 Simplify $\dfrac{\dfrac{x}{x-y}\times\left(\dfrac{x}{y}-2+\dfrac{y}{x}\right)}{\left(x+\dfrac{3xy+y^2}{x-y}\right)\div\dfrac{x+y}{(x-y)^2}}$

2 Factor $4x^4-4x^2y^2+9y^4$, $a^{4m}-b^{2n}$, $a^2b^2+a^2x-b^2x^2-x^3$, a^6+b^6, $4x^2y^4-1+6x-9x^2$

3 Solve $\begin{cases} x+2y=12 \\ xy+y^2=32 \end{cases}$

4 Solve $\sqrt{x}+\sqrt{x+a}=\dfrac{2a}{\sqrt{x+a}}$

5 Multiply $a^{b+1}+a^b+a$ by $a^{-b}-a^{-b+1}$

6 Expand by the binomial theorem $\left(\dfrac{x}{y}-\dfrac{y^2}{2}\right)^5$, giving all the work for finding the coefficients.

7 Solve $\dfrac{5z-x}{2y-3z}=1$, $\dfrac{y-2z}{3y-2x}=1$, $\dfrac{3y-2x}{3z-7}=\dfrac{1}{2}$

8 The difference of the cubes of two consecutive numbers is 817; find the numbers.

9 Solve $\dfrac{x-a}{x}+\dfrac{x}{x-a}=\dfrac{5}{2}$

10 Simplify $\frac{1}{2}\sqrt{27}+\frac{1}{2}\sqrt{147}-\sqrt{5\frac{1}{3}}$; $x\sqrt{x}+y\sqrt{y}\div\sqrt{x}+\sqrt{y}$; $\dfrac{2\sqrt{a}+b\sqrt{b}}{\sqrt{a}+b\sqrt{b}}$

11 A man wishing to give 35 cents to each of a certain number of boys, finds that he lacks 20 cents, but that he can give each boy 33 cents and have 4 cents left; what sum has he and how many boys are there?

12 Find the cube root of $8a^3+12a^2-54a-59+\dfrac{135}{a}+\dfrac{75}{a^2}-\dfrac{125}{a^3}$

13 Find the least common multiple of $a^4-2a^3+4a^2-6a+3$ and $a^4-a^3-2a^2+3a-1$

14–15 Solve $\begin{cases} xy-2y^2=1 \\ x^2+xy=12 \end{cases}$