

## INTERMEDIATE ALGEBRA

Monday, June 12, 1911—9.15 a. m. to 12.15 p. m., only

Write at top of first page of answer paper (a) name of school where you have studied, (b) number of weeks and recitations a week in algebra.

The minimum time requirement is two recitations a week for a school year or four recitations a week for half a school year, after the completion of elementary algebra.

Answer eight questions, selecting two from each group. No credit will be allowed unless all operations (except mental ones) necessary to find results are given; simply indicating the operations is not sufficient.

**Group I** 1 Find the prime factors of the following:  $\frac{8}{a^2} = 2^3 b^3$ ;  
 $1 - m^2 n^2 - p^2 r^2 + 2mnp r$ ;  $8a^{12} + 8am^{12}$ ;  $4(x-y)^2 - (x-y)$

2 In the proportion  $a:b::c:d$ , prove that the terms are in proportion by (a) inversion, (b) composition.

3 Form the quadratic equation whose roots are  $-4 + 5\sqrt{3}$  and  $-4 - 5\sqrt{3}$ . State the relation between the roots and the coefficients of the equation thus formed.

**Group II** 4 Find the number of terms in an arithmetical progression if  $d = 3$ ,  $l = 303$ ,  $a = 5$ .

Find the sum of the series 3, -6, 12 . . . to 6 terms.

5 Simplify  $3\sqrt{3} + \sqrt{-3}$ ;  $5\sqrt{-\frac{1}{2}} - 3\sqrt{-\frac{1}{2}} + 4\sqrt{-50} - \sqrt{-200}$ ;  
 $(-\frac{1}{2} + \frac{1}{2}\sqrt{-3})^2$

6 Solve  $4x^2 - 5x + 1 = 0$

**Group III** 7 Plot the graph of the equation  $x^2 + 2x - 8 = y$

8 If the length of a rectangle is increased by 2 feet and its breadth is diminished by 1 foot its area remains the same, but if its length is diminished by 2 feet and its breadth diminished by 4 feet it loses  $\frac{1}{4}$  of its area; find its length and breadth.

9 Simplify and express with positive indices:

$$\left(\frac{a^{-\frac{1}{2}} x^{\frac{1}{2}}}{x^{-1} a}\right)^2 + \sqrt[3]{\frac{a^{-1}}{x^{-2}}} + \frac{7a^2 \sqrt[3]{x^{-6}}}{8a^{-5} \sqrt[3]{x^{-4}}}$$

**Group IV** 10 Solve  $\begin{cases} \frac{1}{x} + \frac{1}{y} = 3 \\ \frac{1}{x^2} + \frac{1}{y^2} = \frac{7}{3} \end{cases}$

11 Expand by the binomial formula  $(1 - \frac{5}{2x})^2$

12 Derive the formula for (a) the last term of a geometric series, (b) the sum of a geometric series.