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

Five recitations a week for a school year, in a recognized academic school, is the regular requirement, and any statement showing less or other than this should be accompanied by a satisfactory claim or explanation made by the candidate and certified by the principal; otherwise such paper will be returned.

Answer eight questions, selecting two fromach 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. Simplify \( \frac{1 + \frac{a}{a+1}}{1 + \frac{(a+1)^2 - a^2}{a^2 - 1}} \)

2. Find the prime factors of four of the following: \( a^4 - 16; 20x^2 - 60xy + 15y^2; 6ax - 10ay - 21bx - 35by; y^2 - y + \frac{1}{4}; 1 - \frac{x^3}{8} \)

3. Solve \( \begin{cases} ax + by = m \\ bx - ay = n \end{cases} \)

**Group II**

4. Reduce each of the following to its simplest form: \( \sqrt{3} + 5\sqrt{2}(2\sqrt{3} + 3\sqrt{2}); \sqrt{192} + \sqrt{132}; \sqrt{18} + \sqrt{50} - \sqrt{72}; \frac{3}{2} \times \frac{3}{4} \)

5. It required as many days for a number of men to dig a trench as there were men; if there had been 6 men more the work would have been done in 8 days. Find the number of men.

6. Solve \( x^2 + 5ax = 14a^2 \)

**Group III**

7. Solve \( \begin{cases} 2x^2 + xy = 2x \\ x^2 - y^2 = 5 \end{cases} \)

8. The length of a picture at the inner edge of the frame is twice its width; the frame is 4 inches wide and has an area of 328 square inches. Find the dimensions of the picture.

9. Solve \( \sqrt{x + 7} + \sqrt{x} = 7 \)

**Group IV**

10. The area of a certain square is \( \frac{1}{3} \) of the area of a certain other square and its side is \( \frac{1}{3} \) of a yard less; find the side of each square.

11. Two quarts of alcohol are mixed with 5 quarts of water; find the number of quarts of alcohol that must be added to make the mixture three fourths alcohol.

12. Define exponent, surd, term, reciprocal, elimination.