The University of the State of New York

226TH HIGH SCHOOL EXAMINATION

INTERMEDIATE ALGEBRA

Monday, January 16, 1922—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 (1) elementary algebra, (2) intermediate algebra.

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

Answer eight questions, including either question 9 or question 10. Credit will not be granted unless all operations (except mental ones) necessary to find results are given; simply indicating the operations is not sufficient. Each answer should be reduced to its simplest form.

In the examination in intermediate algebra the use of the slide rule will be allowed for checking, provided all computations with tables are shown on the answer paper.

1 Find the prime factors of *each* of the following:

$5x^{4a} - 15x^{3a} - 90x^{2a}$ [2½]

$x^3 - 7x^2 + 4x + 12$ [2½]

$9x^{4a} - 30x^{3a} + 25$ [2½]

$y^3 - .125$ [2½]

$x^4 - (5x - 6)^2$ [2½]

2 *a* Rationalize the denominator in $\dfrac{2\sqrt{3} + 3\sqrt{2}}{5 + 2\sqrt{6}}$ [4]

b Find the value of *each* of the following expressions:

$(-64)^{-\frac{1}{3}}; \quad \dfrac{3^{-2} + 5(2)^0}{3 - 4(3)^{-1}}$ [8]

3 Solve for *x* and check:

$3\sqrt{x} - \sqrt{9x - 32} = \dfrac{8}{\sqrt{9x - 32}}$ [10, 2½]

4 In any quadratic equation in one unknown, what is the test for (*a*) real roots, (*b*) equal roots, (*c*) imaginary roots, (*d*) rational roots? [4]

Using these tests, determine, without solving the equations, the nature of the roots in *each* of the following equations [Leave all work on your paper]:

$3x^2 = -8 + 5x$ [2½]

$2x^2 - 5 = 3x$ [2½]

$4\sqrt{3}x = 4x^2 + 3$ [3½]

5 *a* In the formula $\dfrac{a}{g} = \dfrac{h - L}{h + L}$ solve for *h*. [6½]

b Find the value of *h* to the *nearest* tenth when $a = 5.28$, $g = 16.08$, $L = 4.70$ [6]

6 Deduce the fundamental formula for the sum of a geometric progression in terms of the first term, the ratio and the number of terms. [12½]

7 *a* Show how you would find the logarithm of *each* of the following numbers, given the logarithm of 2 and the logarithm of 3: 6, $\frac{2}{3}$, $\sqrt[3]{12}$ [1, 1, 2]

b By the use of logarithms find the value of

$$\dfrac{.0192\,(82.17)^2}{\sqrt[3]{.938}}$$ [8½]

8 Solve for *x* and *y* and correctly group your answers:

$x^3 - y^3 = 26$

$x^2 + xy + y^2 = 13$ Solution [9], grouping [3½]

9 Goods cost a merchant \$72; at what price should he mark them so that he may sell them at a discount of 10% from this marked price and still make a profit of 20% of the sale price? [Arithmetic solution not accepted.] Equation [9], solution [3½]

10 Find to the *nearest* hundredth the side of a square whose area is doubled when its sides are increased by 2. Equation [6½], solution [6]

11 Represent graphically the equation $x^2 - 2x = y$. From this graph determine (*a*) the roots of $x^2 - 2x = 0$, (*b*) the roots of $x^2 - 2x = 6$ to the *nearest* tenth. Representing the equation [8½], *a* [2], *b* [2]