The University of the State of New York

222D HIGH SCHOOL EXAMINATION

ADVANCED ALGEBRA

Monday, January 19, 1920—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, (3) advanced algebra.

The minimum time requirement is five recitations a week in algebra for two school years.

Answer 10 questions, including three from group I, four from group II and three from group III. Each answer should be reduced to its simplest form.

Group I

Answer three questions from this group.

1 Find the value of $\frac{\sqrt{7}+\sqrt{2}}{\sqrt{7}-\sqrt{2}}$ stating the result to the nearest thousandth.

2 By the aid of the binomial formula, find the value of $(1.045)^7$, that is, $(1+0.04\frac{1}{2})^7$ correct to the *third* decimal place. Indicate the work necessary to check the result by the use of logarithms.

3 Express as a common fraction the value of the repeating decimal 0.4373737 . . .

4 Find the number of ways in which a combination lock of 100 numbers may be set on three numbers when (*a*) repetitions of these numbers are allowed, (*b*) repetitions are not allowed.

Group II

Answer four questions from this group.

5 Represent graphically *each* of the roots of the equation $x^4-1=0$ and explain from the graph why the sum of the roots is zero.

6 Find all the roots of $x^3+3x^2-30x+36=0$

7 Transform the equation $x^3-7x^2+2=0$ into an equation having no second power of the unknown quantity.

8 Determine the first significant figure of each real root of the equation $x^3+9x^2+24x+17=0$

9 Find to the nearest thousandth the root of the equation $x^3-3x^2-4x+13=0$ that lies between 2.3 and 2.4.

Group III

Answer three questions from this group.

10 Two wheels of a machine are tangent to each other and the distance between their centers is 9 inches. The sum of the areas of the wheels is 198 square inches. Find, to the nearest hundredth of an inch, the radius of each wheel. $[\pi=\frac{22}{7}]$

11 An arrow is projected upward with a velocity of 96 feet per second. The relation of initial velocity (V), space described (S) and time (t) being given by the equation $S=Vt-\frac{1}{2}gt^2$, find after how many seconds the arrow will be 80 feet above ground. [Assume that $g=32$.] Are both results possible? Explain.

12 A certain steamship line has eight steamers running between New York and Southampton. In how many ways is it possible to cross from New York to Southampton and return by a different steamer of this line? Write an explanation of the formula or method used in obtaining the result.

13 If S is taken as the quantity of common salt that will dissolve in 100 parts by weight of water at t degrees centigrade, it is found that

$$\log S=a+0.01bt+c(0.01t)^2$$

Using the table of logarithms, from the following data form (do not solve) the equations, from which can be found the values of a, b and c:

If $t=$	25	60	80
Then $S=$	36.13	37.25	38.22

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DIRECTIONS FOR RATING

The direction, "Less than 60% of the credit should be granted when an error in computation occurs," should be followed in rating all incorrect answers to questions which fall under the topics mentioned in "Suggestions on the Rating of Regents Examination Papers in Mathematics" under "General 3."

Except in schools where the "committee system" is used, teachers are urged to mark papers cumulatively, that is, to add the credits earned by each answer to the total credits earned by preceding answers so that the mark given to the last answer is the per cent to which the paper is entitled, e. g. consecutive answers earning 5, 7, 4 etc. respectively should be marked 5, 12, 16 etc. respectively.

1 10 credits
- Allow 4 credits for rationalizing.
- Allow 6 credits for simplifying the result if written 3.297; allow 5 credits if written 3.296.

2 10 credits
- Allow 3 credits for correct expansion.
- Allow 4 credits for correct simplification and addition.
- Allow 3 credits for explanation of the check by logarithms.

3 10 credits

4 10 credits
- *a* 5 credits
- *b* 5 credits

5 10 credits
- 3 credits for finding the roots.
- 3 credits for representing the roots graphically.
- 4 credits for explaining why the sum equals zero.

6 10 credits
- Allow 6 credits for finding the rational roots.
- Allow 4 credits for finding the irrational roots.

7 10 credits

8 10 credits
- Allow 4 credits for determining $-1.+$
- Allow 4 credits for determining $-3.+$
- Allow 2 credits for determining $-4.+$

9 10 credits
- Allow 2 credits for determining hundredth's place.
- Allow 5 credits for determining thousandth's place.
- Allow 3 credits for determining if "nearest thousandths" should be one more.

10 10 credits
- Allow 5 credits for forming equations.
- Allow 4 credits for finding the first solution.
- Allow 1 credit for finding the second solution.

11 10 credits
- Allow 6 credits for the solution.
- Allow 4 credits for the explanation.

12 10 credits
- Allow 4 credits for the solution.
- Allow 6 credits for the explanation.

13 10 credits
- Allow 10 credits if the logarithms are correctly found and the simplifying correctly done.
- Allow 6 credits if the logarithms are not found.