The University of the State of New York

221ST HIGH SCHOOL EXAMINATION

INTERMEDIATE ALGEBRA

Monday, June 16, 1919—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 the first four questions and four of the others. Each answer should be reduced to its simplest form.

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

$1-x^2+2xy-y^2$

$0.0016\,x^4-1$

$x^4+y^4+x^2y^2$

$x^3+x^2-6x-18$

2 Simplify *each* of the following expressions:

$$\frac{\frac{a^3}{b^3}+1}{1+\frac{a}{b}}; \quad \frac{3ax^2+3b}{6x-3}+\frac{2(bx+ax^2)}{1-4x^2}-\frac{ax^2-b}{2x+1}$$

3 Multiply both numerator and denominator of the fraction

$$\frac{2+\sqrt{3}+\sqrt{5}}{2+\sqrt{3}-\sqrt{5}}$$

by $2+\sqrt{3}+\sqrt{5}$. Then rationalize the denominator of the resulting fraction.

4 *a* Determine, by finding their sum and their product, whether $-\frac{1}{2}+\sqrt{2}$ and $-\frac{1}{2}-\sqrt{2}$ are the roots of the equation $x^2+x=-1$. Give the reason for your answer.

b Form the equation whose roots are $-2\frac{3}{4}$ and $\frac{5}{8}$

c State the sum and the product of the roots of the equation $x=8-x^2$

5 Solve the equation $x^2+2x+k=0$ and state for what values of k the roots are real, for what value they are equal and for what values they are imaginary.

6 Simplify the following expressions:

a $\dfrac{\sqrt[3]{a^2}}{\sqrt{a^3}}$

b $\sqrt[3]{\dfrac{9V^2}{16\pi^2}}$

7 Find to *two* decimal places the value of $\sqrt{3.6\pi V^3}$ when $V=6.281$

8 Since 9 is a factor of 711 it is suggested that 9 may be a root of the equation $37x^2=254x+711$; without solving or substituting, prove that 9 is a root and then find the other root.

9 Solve the following simultaneous equations:

$$\begin{cases} 3x^2-4y=59 \\ 2x^2+3y^2=98 \end{cases}$$

10 If a stone is thrown vertically upward with a velocity of 110 feet per second, its height in feet t seconds later is $110t-16t^2$; find when, if at all, the stone will be 150 feet above the ground and when, if at all, it will be 200 feet above the ground.

11 *a* Find the hundredth term of the progression

1, 7, 13, . . .

b Find the sum of the first 15 terms of the progression

2, 4, 8, . . .

12 By the aid of graphs find *one* solution of the following simultaneous equations:

$$\begin{cases} x^2+y=7 \\ x+y^2=11 \end{cases}$$

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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."

In rating all problems, see "Suggestion 12."

No credit should be allowed for checks unless made in original statements.

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 $12\frac{1}{2}$ credits

Allow 9 credits for factoring the first three expressions (3 each).

Allow $3\frac{1}{2}$ credits for factoring the last expression.

2 $12\frac{1}{2}$ credits

Allow $3\frac{1}{2}$ credits for simplifying the first expression. Allow no partial credit.

Allow 9 credits for simplifying the second expression. Allow 4 credits for expressing the sum with the least common denominator and 5 credits for combining the terms.

3 $12\frac{1}{2}$ credits

Allow $5\frac{1}{2}$ credits for correct multiplication by $2+\sqrt{3}+\sqrt{5}$

Allow 7 credits for correct rationalization of denominator.

4 $12\frac{1}{2}$ credits

a $4\frac{1}{2}$ credits

Allow $2\frac{1}{2}$ credits for determining whether $-\frac{1}{2}+\sqrt{2}$ and $-\frac{1}{2}-\sqrt{2}$ are roots of the equation, and 2 credits for reason for answer.

b Allow 4 credits.

c Allow 4 credits.

DIRECTIONS FOR RATING—*concluded*

5 $12\frac{1}{2}$ credits

Allow 3 credits for correct solution.

Allow 4 credits for stating $k=1$ or < 1 (2 each).

Allow $2\frac{1}{2}$ credits for stating $k=1$.

Allow 3 credits for stating $k>1$.

6 $12\frac{1}{2}$ credits

a $6\frac{1}{2}$ credits

b 6 credits. Allow no partial credit.

7 $12\frac{1}{2}$ credits

See "General Suggestion 3."

8 $12\frac{1}{2}$ credits

Allow $7\frac{1}{2}$ credits for proving that 9 is a root.

Allow 5 credits for finding the other root.

9 $12\frac{1}{2}$ credits

Allow $6\frac{1}{2}$ credits for finding the first pair of values.

Allow 6 credits for finding the other four different values ($1\frac{1}{2}$ each).

10 $12\frac{1}{2}$ credits

Allow $7\frac{1}{2}$ credits for finding t when the stone is 150 feet above the ground.

Allow 5 credits for showing that the stone will not reach the height of 200 feet.

11 $12\frac{1}{2}$ credits

a Allow 5 credits.

b Allow $7\frac{1}{2}$ credits.

12 $12\frac{1}{2}$ credits

See Suggestion 19.

Allow 8 credits for the graphs.

Allow $4\frac{1}{2}$ credits for finding one solution.