The University of the State of New York

222D HIGH SCHOOL EXAMINATION

INTERMEDIATE ALGEBRA

Monday, January 19, 1920—9.15 a. m. to 12.15 p. m., only

Answer the first six questions and two of the others. 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.

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

$16y^4 - 0.0081$

$(2x-3)^2 + 3(2x-3) - 10$

$4a^2 - 16b^2 + 4a + 1$

$x^3 + x^2 - 14x - 24$

2 In *each* of the following perform the indicated operation and write the result in its simplest form:

$$\frac{c^2-22}{c^2-2c-8} + \frac{c-5}{4-c}; \quad \frac{x^2-4x+4}{10x-21} \div \frac{x^2+x-6}{10x^2+9x-63}$$

3 Rationalize the denominator in *each* of the following and express the result in its simplest form:

$$\frac{6}{\sqrt[3]{4a^2}}; \quad \frac{2\sqrt{3}+3\sqrt{2}}{\sqrt{6}+\sqrt{3}}$$

4 *a* Without solving, show how to find the sum of the roots and the product of the roots of the equation $4x^2 - 12x = 3$

b Determine from the result whether $\frac{3}{2} - \sqrt{3}$ and $\frac{3}{2} + \sqrt{3}$ are the roots of this equation.

5 *a* Multiply $2x^2 - 3x + 5$ by $3x^{-2} + 2x^{-1} - 6$

b Express the result in descending powers of x.

c Write this result, using positive exponents only.

6 A piece of tin 9″ by 12″ is to be made into an open box with a base area of 60 square inches by cutting equal squares from the four corners and then bending up the edges; what is the size, to the nearest tenth of an inch, of the square cut from each corner?

INTERMEDIATE ALGEBRA—*concluded*

7 Writing $(1.06)^6$ as $(1+.06)^6$, (*a*) expand by the binomial formula, (*b*) find the value to *two* decimal places. [Carry the work far enough to be sure that terms neglected do not affect the second decimal place.] In this example what terms will be neglected?

8 *a* Unite into a single term:

$$6\sqrt{2\tfrac{2}{3}a^3} - 2(24ab^2)^{\frac{1}{2}} + a\sqrt{54a}$$

b Evaluate $(0.125)^{-\frac{2}{3}} + \dfrac{3}{2+2^{-1}}$

c Evaluate 0.6×32^0, 0.8×4^{-2}, $12 \times 9^{-\frac{1}{2}}$

9 Answer either *a* or *b*:

a How many terms must constitute the series
$$7 + 10 + 13 + \ldots$$
in order that the sum may be 242?

b (1) Multiply, using logarithms: 27.3×0.96

(2) Solve for n: $4 = (1.04)^n$

10 Two trains run at uniform rates over the same 120 miles of rail; one of the trains travels 5 miles an hour faster than the other and takes 20 minutes less time to run the distance. Find the rate of the faster train.

11 Solve the following set of equations, correctly group your answers and check either group:

$$\begin{cases} x^2 + y^2 = 20 \\ x + 2y = 5 \end{cases}$$

12 Represent graphically the following set of equations and from the graph draw a conclusion as to the nature of the solutions to this set:

$$\begin{cases} y^2 = 8x + 1 \\ 4x - 5y = -13 \end{cases}$$

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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 3 credits for each of the first three parts.
    Allow $3\frac{1}{2}$ credits for the last part.
    Allow no partial credit.

2 $12\frac{1}{2}$ credits
    Allow $7\frac{1}{2}$ credits for the first part—4 credits for the correct writing of the sum with the lowest common denominator, 2 credits for the correct combining of terms and $1\frac{1}{2}$ credits for the correct reduction to lowest terms.
    Allow 5 credits for the second part—4 credits for correct factoring and 1 credit for correct cancelation.
    Allow no partial credit on either part.

3 $12\frac{1}{2}$ credits
    Allow 5 credits for the first part—4 credits for correct rationalization and 1 credit for correct simplification of the result.
    Allow $7\frac{1}{2}$ credits for the second part—3 credits for correct rationalization and $4\frac{1}{2}$ credits for correct simplification of the result.
    Allow no partial credit on either part.

4 $12\frac{1}{2}$ credits
    a 6 credits—3 credits for each part.
    b $6\frac{1}{2}$ credits
    Allow no partial credit on either part.

5 $12\frac{1}{2}$ credits
    a $8\frac{1}{2}$ credits
    b 2 credits
    c 2 credits

6 $12\frac{1}{2}$ credits
    Allow 6 credits for forming the equation, 2 credits for correctly simplifying and $4\frac{1}{2}$ credits for correctly solving the equation.

7 $12\frac{1}{2}$ credits
    a Allow 6 credits for correct expansion.
    b Allow $6\frac{1}{2}$ credits for correctly simplifying the expansion.

8 $12\frac{1}{2}$ credits
    a 4 credits
    b $5\frac{1}{2}$ credits
    c 3 credits
    Allow no partial credit on any part.

9 $12\frac{1}{2}$ credits
    a Allow 5 credits for correct formula and substitution and $7\frac{1}{2}$ credits for correct solution.
    b (1) $7\frac{1}{2}$ credits
       (2) 5 credits
    Allow no partial credit on either part.

10 $12\frac{1}{2}$ credits
    Allow $7\frac{1}{2}$ credits for correct equation and 5 credits for correct solution.
    Allow no partial credit on either part.

11 $12\frac{1}{2}$ credits
    Allow $6\frac{1}{2}$ credits for the first solution.
    Allow 2 credits for the second solution.
    Allow 1 credit for correct grouping of results.
    Allow 3 credits for check.
    Allow no partial credit on any part.

12 $12\frac{1}{2}$ credits
    Allow 6 credits for correctly representing the first equation.
    Allow $3\frac{1}{2}$ credits for correctly representing the second equation.
    Allow 3 credits for drawing conclusion.