

INTERMEDIATE ALGEBRA

Monday, January 17, 1916—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 six from group I and two from group II. Each answer should be reduced to its simplest form.

Group I

Answer six questions from this group.

1 a Perform the indicated operations:

$$\left(2a - \frac{a^2 - b^2}{a}\right) \left(3b + \frac{a^2 + b^2}{b}\right) \div \left(\frac{a^2}{b^2} + 5 + \frac{4b^2}{a^2}\right)$$

b Find the square root of the following:

$$(x^2 + 3x + 2)(x^2 - 1)(x^2 + x - 2)$$

2 a Find the value of $\frac{1}{8^{-\frac{2}{3}}} - 3a^0 + 27^{-\frac{1}{2}} - 1^{\frac{3}{2}}$

b Simplify $\frac{a - a^{-1}}{a^{\frac{1}{3}} - a^{-\frac{1}{3}}} - \frac{a + a^{-1}}{a^{\frac{1}{3}} + a^{-\frac{1}{3}}}$

3 a Find the fifth term of $\left(\frac{a^2}{2} - a^{-1}b^{-1}\right)^8$

b Find the value of $\frac{8 - \sqrt{3}}{2 - \sqrt{3}}$ correct to three decimal places.

4 Solve (four roots) $(x^2 + x - 2)^2 + (x^2 + x - 2) - 20 = 0$

5 a Form the equation whose roots are $3 - \sqrt{5}$, $3 + \sqrt{5}$

b Form the equation the sum of whose roots is one greater and the product of whose roots is two less than the sum and the product respectively of the roots of $x^2 + 5x - 3 = 0$

6 If the first two terms of an arithmetic progression are 5, 3, write the next two terms. Find by formula the 13th term. Find the sum of 15 terms.

7 If the first two terms of a geometric progression are 5, 3, write the next two terms. Find by formula the 8th term. Find the sum of an infinite number of terms.

8 Draw the graph of $x^2 - 5x + 3 = y$ and thus determine approximately the roots of $x^2 - 5x + 3 = 0$

Group II

Answer two questions from this group.

9 Find the arithmetic progression whose first term is 3 and whose first, third and sixth terms form a geometric progression.

10 An open box is made from a square piece of tin by cutting out a 6 inch square from each corner and turning up the sides; the box contains 150 cu. in. Find the area of the original square.

11 *a* What must be the value of k in order that the roots of $2x^2 - kx - 5 = 0$ shall be $\frac{1}{2}$ and -5 ?

b Find the values of m for which the roots of $x^2 - mx + m + 3 = 0$ are equal.

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DIRECTIONS FOR RATING

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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.

12½ credits each

1 a 6½ credits

Allow 1½ credits for correctly reducing each mixed number to simple fractional form.

Allow 2 credits for correct cancelation.

b 6 credits

Allow 3 credits for correct factoring (1 credit each).

Allow 3 credits for finding correct square root indicated or expanded.

If factors are multiplied together and the root of the product is found, allow 1 credit for correct multiplication and 5 credits for correct root.

2 a 4½ credits

Allow 1 credit for each correct reduction.

Allow ½ credit for correct sum.

b 8 credits

Allow 2 credits for changing to positive exponents.

Allow 2 credits for simplifying each fraction.

Allow 2 credits for finding result.

Or

If fractions are combined without a change of exponents or if the numerators are divided by the denominators in each fraction, allow 6 credits if the work is correct but answer is not in simplest form.

3 a 6 credits

Allow 2 credits for correct formula for r^{th} term.

Allow 3 credits for correct substitution.

Allow 1 credit for simplification.

If formula is not used, allow no credit unless enough work is given to show clearly how the result was obtained.

DIRECTIONS FOR RATING—*concluded*

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

When the denominator is rationalized, allow $3\frac{1}{2}$ credits for rationalization.

Allow 3 credits for correct decimal value, or if the denominator is not rationalized, allow but little credit unless the answer is correct.

No deduction should be made if value of $\sqrt{3}$ is given from memory.

4 Allow $6\frac{1}{2}$ credits for finding first correct root.
Allow 2 credits each for the other correct roots.

5 *a* 6 credits

Allow no partial credit except when trinomial is correctly written and is not placed $=0$; in this case allow 4 credits.

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

Allow no partial credit.

6 Allow 1 credit each for writing correct terms.
Allow 1 credit for formula for l .
Allow 4 credits for substitution and reduction.
Allow 1 credit for formula for S .
Allow $4\frac{1}{2}$ credits for substitution and reduction.

7 Allow 1 credit each for writing correct terms.
Allow 1 credit for formula for l .
Allow 4 credits for substitution and reduction.
Allow 1 credit for formula for S .
Allow $4\frac{1}{2}$ credits for substitution and reduction.

8 Allow $8\frac{1}{2}$ credits for correct graph if drawn on coordinate paper.
Allow 2 credits for each root correct within $\frac{3}{10}$ of the value.

9 Allow 8 credits for correct equation.
Allow 3 credits for correct solution.
Allow $1\frac{1}{2}$ credits for writing progression correctly to two or more terms.

10 Allow 7 credits for correct equation.
Allow $4\frac{1}{2}$ credits for solution.
Allow 1 credit for correct area.

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

Allow no partial credit.

b 8 credits

Allow 4 credits for equation $m^2 = 4m + 12$.

Allow 2 credits for each correct value of m .