

INTERMEDIATE ALGEBRA

Monday, June 17, 1918—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.

$$1 \text{ Solve } \begin{cases} \frac{a}{x} - \frac{b}{y} + 1 = 0 \\ \frac{b}{x} - \frac{a}{y} + 1 = 0 \end{cases}$$

2 a Write the discriminant of each of the following equations and from it determine the nature of the roots:

$$x^2 - 7x + 12 = 0$$

$$3x^2 - 10x = -3$$

$$x^2 - 7x = 7$$

$$2x^2 + x + 1 = 0$$

b Form the equation whose roots are $-2 - \sqrt{6}$ and $-2 + \sqrt{6}$

By the shortest method of checking, find whether $-2 - \sqrt{6}$ and $-2 + \sqrt{6}$ are roots of $x^2 + 4x - 2 = 0$

3 Find the dimensions of a rectangle such that its perimeter is 28 inches and its diagonal is 10 inches. [Solve both algebraically and graphically.]

4 Answer two of the following:

a Simplify $25^0 + 0.25^{\frac{1}{2}} - 8^{\frac{1}{3}} \times 4^{-\frac{1}{2}} + 0.027^{\frac{1}{3}}$

b Simplify $\sqrt[n]{\frac{32}{2^{5+n}}}$

c Plot the graph of 2^x , from $x = -4$ to $x = +4$

5 Find the prime factors of the following:

$$4a^2 - 6b - 9 - b^2$$

$$15a^2 - 77a + 10$$

$$x^4 - 4x^2 + 3$$

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

6 Simplify $\frac{\frac{1}{a+x} + \frac{1}{a-x}}{\frac{1}{a-x} - \frac{1}{a+x}}$

Check.

7 Solve $\frac{3x-7}{2x-9} - \frac{3(x+1)}{2(x+3)} = \frac{11x+3}{2x^2-3x-27}$

8 Solve $a+x = \frac{1}{a} + \frac{1}{x}$

9 a Find to three decimal places the value of $\frac{\sqrt{7}-\sqrt{5}}{\sqrt{7}+\sqrt{5}}$

b Find the value of $x^3 - 3x^2 + x + 1$ if $x = 1 - \sqrt{2}$

10 A freight boat leaves New York, sailing for a European port at the rate of 15 knots an hour; five hours later a transport leaves the same harbor, sailing over the same course at the rate of 20 knots an hour. In how many hours will the transport overtake the freight boat? [Solve either algebraically or graphically.]

11 Find the sum of the first n terms of two of the following series:

$$1, 2, 3, 4, \dots$$

$$5, 10, 15, 20, \dots$$

$$2, 4, 8, 16, \dots$$

$$a - 2b, ab^2 - 2b^3, ab^4 - 2b^5, \dots$$

12 The edge of a cube is e , its volume is v and its total surface is s . Express v in terms of e ; s in terms of e ; diagonal of cube in terms of e ; e in terms of s ; v in terms of s .

13 Three old machines completed a job in 80 minutes; after two new machines had been installed, one of which worked three times as fast as all the old machines together, the job was completed by the five machines in 15 minutes. In what time would the second new machine alone have been able to do the work?

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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 all problems solved with two unknowns, no credit should be given for one equation correctly formed if the other is not given or is inaccurate.

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 $7\frac{1}{2}$ credits for first correct result.
Allow 5 credits for second correct result.

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

a Allow 8 credits (2 each).
b Allow $4\frac{1}{2}$ credits.

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

Allow $4\frac{1}{2}$ credits for correct equations.
For algebraic solution, allow 2 credits for finding first pair of roots correctly and 2 credits for finding the other pair.
For graphic solution, allow 2 credits for graphs (1 each) and 2 credits for reading the correct values (1 for each pair).

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

Allow 6 credits for one correct result and $6\frac{1}{2}$ credits for other correct result.

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

Allow 9 credits for correct prime factors of first three expressions (3 each).
Allow $3\frac{1}{2}$ credits for correct prime factors of fourth expression.

DIRECTIONS FOR RATING—concluded

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

Allow 6 credits for simplifying numerator and denominator correctly (3 each).
Allow $3\frac{1}{2}$ credits for correct result.
Allow 3 credits for correct check.

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

Allow 5 credits for clearing fractions correctly.
Allow $7\frac{1}{2}$ credits for correct result.

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

Allow $7\frac{1}{2}$ credits for first correct result.
Allow 5 credits for second correct result.

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

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

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

If solved algebraically, allow $7\frac{1}{2}$ credits for correct equation and 5 credits for correct solution.
If solved graphically, allow 8 credits for graphs (4 each) and $4\frac{1}{2}$ credits for reading correct result.

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

Allow 6 credits for one correct result and $6\frac{1}{2}$ credits for other correct result.

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

Allow $2\frac{1}{2}$ credits for each correct expression.

13 $12\frac{1}{2}$ credits

Allow $7\frac{1}{2}$ credits for correct equation.
Allow 5 credits for correct solution.