INTERMEDIATE ALGEBRA

Wednesday, June 16, 1937 — 9.15 a. m. to 12.15 p. m., only

Instructions

Do not open this sheet until the signal is given.

Group I

This group is to be done first and the maximum time allowed for it is one and one half hours.
If you finish group I before the signal to stop is given you may begin group II. However, it is advisable to look your work over carefully before proceeding, since *no credit will be given any answer in group I which is not correct and in its simplest form.*

When the signal to stop is given at the close of the one and one half hour period, work on group I must cease and this sheet of the question paper must be detached. The sheets will then be collected and you should continue with the remainder of the examination.

Group II

Write at top of first page of answer paper to group II (*a*) name of school where you have studied, (*b*) number of weeks and recitations a week in intermediate algebra.

The minimum time requirement is five recitations a week for half a school year after the completion of elementary algebra.

The use of the slide rule will be allowed for checking but all computations with tables must be shown on the answer paper.

Fill in the following lines:

Name of school...Name of pupil...
....

Detach this sheet and hand it in at the close of the one and one half hour period.

Group I

Answer all questions in this group. Each correct answer will receive $2\frac{1}{2}$ credits. No partial credit will be allowed. Each answer must be reduced to its simplest form.

1 Express in terms of the imaginary unit i the sum of $\sqrt{-16}$ and $2\sqrt{-25}$.

Ans.............

2 Express the fraction $\dfrac{1}{3-\sqrt{3}}$ with a rational denominator.

Ans.............

3 What is the sum of the roots of the equation $2x^2 - 3x + k = 0$?

Ans.............

4 Write in the form $x^2 + px + q = 0$, the equation whose roots are -3 and -4.

Ans.............

5 Factor $x^{3a} - 4x^{2a} + 3x^a$

Ans.............

6 Simplify $\dfrac{\dfrac{1}{a} + \dfrac{1}{b}}{\dfrac{1}{ab}}$

Ans.............

7 Solve the following set of equations for x:

$$2x + 5y = -1$$
$$x - 3y = 5$$

Ans.............

8 The first term of an arithmetic progression is 5, the last term is 21 and the number of terms is 9; find the common difference.

Ans.............

9 Find the sum of the infinite series 9, 3, 1, ...

Ans.............

10 Write the first *two* terms of the expansion $(x - 3y^3)^5$.

Ans.............

11 If x is positive and $y = x - \dfrac{3}{x}$, does y increase or decrease as x increases?

Ans.............

12 Find x correct to the *nearest tenth*, if $\log x = 2.1347$

Ans.............

13 C and A are two points on opposite banks of a river. A line CB, 450 feet long, is perpendicular to CA. Angle CBA is 70°. Find, correct to the *nearest foot*, the length of CA.

Ans.............

14 If $\log \sqrt[3]{n} = a$, express $\log n$ in terms of a.

Ans.............

15 The graph of the equation $y = x^2 - 5$ is (a) a circle, (b) a parabola, (c) an ellipse or (d) two intersecting lines. Which is correct (a), (b), (c) or (d)?

Ans.............

16 The roots of the equation $x^2 + 3x - 7 = 0$ are (a) real and equal, (b) real and rational, (c) real and irrational or (d) imaginary. Which is correct (a), (b), (c) or (d)?

Ans.............

17 The graphs of the equations $3x + 2y = 12$ and $3x + 2y = 6$ are straight lines which (a) coincide, (b) intersect or (c) are parallel. Which is correct (a), (b) or (c)?

Ans.............

[OVER]

[3]

18 Find the value of $5^0 + 16^{-\frac{3}{4}} - \sqrt{0\frac{1}{4}}$

19 Given the formula for the period of the pendulum $t = 2\pi\sqrt{\dfrac{l}{g}}$

Solve the formula for g.

20 Write the formula expressing the relation between x and y as indicated in the following table:

x	2	3	4	−1	−2
y	1	3	5	−5	−7

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Group II

Answer five questions from this group. Full 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. Purely arithmetical solutions for problems will not be accepted.

21 Find, correct to the *nearest tenth*, the roots of the equation $2x^2 + 3x - 3 = 0$ [10]

22 Evaluate the expression $\dfrac{(42.3)^3 \times 0.0135}{\sqrt[5]{136.7}}$ [10]

23 Write the equations that would be used in solving any *two* of the following problems; in each case state what the unknown letter or letters represent: [Solution of the equations is not required.]

   a Two numbers are in the ratio $5:6$; one half of the smaller is 3 more than one third of the larger. Find the numbers.   [5]

   b The sum of the digits of a two-digit number is 10. If the digits are reversed the new number exceeds the original number by 36. Find the number.   [5]

   c A rectangular plot of ground is twice as long as it is wide. Surrounding it is a walk 4 feet wide whose area is 352 square feet. What are the dimensions of the plot?   [5]

24 How much pure vinegar must be added to 40 gallons of a 25% solution of vinegar to produce vinegar that is 40% pure?   [7, 3]

25 A real estate agent bought a number of acres of land for $900. He kept 5 acres for himself and sold the rest at an advance of $10 an acre. If he received $825 for the land he sold, how many acres did he buy?   [6, 4]

26 A church fair wishes to dispose of an article valued at $18, by selling tickets. These tickets are numbered consecutively beginning with 1, and each person drawing a ticket pays in cents the amount equal to the number on the ticket if that number is 50 or less. If the number drawn is greater than 50, he pays just 25 cents. How many numbers are there in all?   [10]

27 *a* Using the same set of axes, plot the graphs of the equations $x^2 + y^2 = 16$ and $x - y = -2$ [3, 2]

   b On the graphs made in answer to *a*, indicate by A and B the two points which represent the common solutions.   [1]

   c Estimate from the graph the solutions correct to the *nearest tenth*.   [2]

   d Will the graph of $x^2 + y^2 = 16$ intersect the graph of $x - y = 7$?   [1]

   e Do the equations $x^2 + y^2 = 16$ and $x - y = 7$ have any real common solution?   [1]

*28 Find the three roots of the equation $x^3 - 4x^2 + 7x - 6 = 0$ [10]

* This question is based on one of the optional topics in the syllabus.