INTERMEDIATE ALGEBRA

Monday, June 15, 1959—1:15 to 4:15 p.m., only

Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed.

1. Express as a single term the sum of $\sqrt{-9}$ and $4i$ 1.....

2. Express $\frac{5}{\sqrt{3}-1}$ as an equivalent fraction with a rational denominator. 2.....

3. Find *one* of the roots of the equation $2x^2 + 5x - 12 = 0$. 3.....

4. Find the value of $(2a)^0 + a^{-\frac{1}{2}}$ when $a = 9$. 4.....

5. Write in *simplest* form the first *two* terms in the expansion of $(2x - y)^5$. 5.....

6. Find to *four* decimal places the logarithm of 39.56. 6.....

7. Find the number whose logarithm is 8.7829 — 10. 7.....

8. Write an equation of the straight line whose slope is —2 and which passes through the point (3,0). 8.....

9. The following table expresses a linear relation between x and y. Find the *slope* of the line which passes through the points given in the table.

x	—2	0	4	6
y	—1	2	8	11

9.....

10. The roots of an equation of the form $x^2 + px + q = 0$ are $2 + \sqrt{5}$ and $2 - \sqrt{5}$. Find the value of p. 10.....

11. Find the product of the roots of the equation $2x^2 - 5x + 6 = 0$. 11.....

12. What is the name of the graph whose equation is $x^2 - 9y^2 = 4$? 12.....

13. Find the sum of the infinite geometric progression $1, -\frac{1}{3}, \frac{1}{9}, \ldots\ldots$ 13.....

14. The first term of an arithmetic progression is a, the last term is l, the common difference is d and the number of terms is n. Express d in terms of a, l and n. 14.....

15. Express in *simplest* form: $\sqrt{60} - 6\sqrt{\frac{5}{3}}$ 15.....

16. If the fraction $\frac{287}{1{,}000{,}000}$ is expressed in the form 2.87×10^n, what is the value of n? 16.....

17. Find in *simplest* form the value of $\frac{r+s}{1-rs}$ when $r = 1/3$ and $s = 1/7$. 17.....

18. If 5 pounds of pure salt are added to 20 pounds of a solution containing 10% salt, what fractional part of the resulting solution is salt? 18.....

Directions (19-25): Indicate the correct completion for *each* of the following by writing the letter *a, b, c* or *d* on the line at the right.

19. In right triangle *ABC*, angle *C* is 90°. If $BC = 50$ and angle $A = 27°$, then *AB*, to the *nearest integer*, is (*a*) 110 (*b*) 98 (*c*) 56 (*d*) 23 19.....

20. When combined into a single fraction, $\frac{3}{x+2} - \frac{2}{x-2}$ is equal to (*a*) $\frac{1}{x}$ (*b*) $\frac{5}{x+2}$ (*c*) $\frac{x-10}{x^2-4}$ (*d*) $\frac{x-4}{x^2-4}$ 20.....

21. Given that T varies directly as the square of L. If L is multiplied by 2, then T is (*a*) multiplied by 2 (*b*) multiplied by 4 (*c*) divided by 2 (*d*) divided by 4 21.....

22. If $\log N = 2 \log x + \log y$, then N equals (*a*) $2x + y$ (*b*) $x^2 + y$ (*c*) x^2y (*d*) $2xy$ 22.....

23. The equation $\sqrt{x} + 3 = 1$ has (*a*) one positive root only (*b*) one negative root only (*c*) one positive and one negative root (*d*) no roots 23.....

24. Given the equation $y = ax^2 + bx + c$ in which a, b and c are integers. If the graph of this equation intersects the x-axis in two distinct points whose abscissas are integers, then $b^2 - 4ac$ may equal (*a*) —16 (*b*) 0 (*c*) 5 (*d*) 9 24.....

25. When drawn on the same set of axes, the graphs of $2x + 3y = 3$ and $x - y = 4$ intersect at the point (*a*) whose abscissa is 3 (*b*) whose abscissa is 9 (*c*) whose ordinate is 3 (*d*) whose ordinate is 9 25.....

Part II

Answer three questions from this part. Show all work unless otherwise directed.

26. Solve the following set of equations and check in both equations: [8, 2]

$$y^2 - 2xy = 5$$
$$3x - y = -1$$

27. Find to the *nearest tenth* the roots of the equation $3x^2 + 9x + 4 = 0$. [10]

28. A pendulum formula is given by the equation

$$t = 6.28\sqrt{\frac{L}{32.2}}.$$

Using logarithms, find t to the *nearest hundredth* if $L = 20.9$. [10]

29. *a.* *Draw* the graph of $y = x^2 + 2x - 5$ from $x = -4$ to $x = 2$, inclusive. [6]

b. From the graph made in answer to part *a*, estimate to *tenths* the roots of the equation $x^2 + 2x - 5 = 0$. [2]

c. Find the minimum value of k for which the roots of the equation $x^2 + 2x - 5 = k$ are real. [2]

*The following questions, *30 and *31, are based upon optional topics in the syllabus, and one of them may be substituted for any one question in either part II or part III. Therefore one, but not both, of these questions may be included in the total of 5 required questions from parts II and III.*

*30. In how many years will $675 amount to $960, if interest is compounded annually at 4%? [Use the formula $A = P(1 + r)^n$.] [10]

*31. Solve the following set of equations and check: [8, 2]

$$2x - y + 3z = 10$$
$$3x - 2y - z = 22$$
$$4x + 3y - 2z = 13$$

Part III

Answer two questions from this part. Show all work unless otherwise directed. Only algebraic solutions will be accepted in 33-35.

32. Write the equations that would be used in solving the following problems. In *each* case state what the letter or letters represent. [*Solution of the equations is not required.*]

a. In a two-digit number, the ratio of the tens digit to the units digit is 3:2. The sum of the original number and the number with the digits interchanged is 165. Find the original number. [5]

b. A pilot left airport *A* and flew 200 miles to a point *B* with a tailwind which increased his speed by 20 miles per hour. From *B* he flew 225 miles to a point *C* against a headwind which decreased his speed by 30 miles per hour. If his total flying time was 2½ hours, find the average speed of the plane in still air. [5]

33. A fruit dealer paid a total of $67 for strawberries and peaches. He sold the strawberries at a profit of 20% on the cost and the peaches at a loss of 2% on the cost. If his total profit was $8.56, how much did he pay for *each* kind of fruit? [6, 4]

34. A contractor knows that it would take 4 days longer for a small dump truck to haul an order of gravel to a construction project than for a large one to haul the same order. By using 8 small and 6 large dump trucks working together, the order was delivered in 1 day. Find the number of days it would have taken one small truck, working alone, to deliver the gravel. [6, 4]

35. The first three terms of a sequence of numbers are represented by $x - 5$, $x + 3$ and $2x - 6$.

a. If the sequence is an arithmetic progression, find the numerical value of the *fourth* term. [4]

b. If the sequence is an increasing geometric progression, find the numerical value of the *fourth* term. [6]