# INTERMEDIATE ALGEBRA

Wednesday, January 20, 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 pupil..............................

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

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 What is the name of the graph whose equation is $4x^2 - 9y^2 = 25$?  Ans...............

2 What is the positive geometric mean between $\frac{1}{2}$ and $\frac{1}{32}$?  Ans...............

3 In the series $2, 5\frac{1}{2}, 9, \ldots$, find the *13th* term.  Ans...............

4 Find log 32.07  Ans...............

5 If $\log x^2 = 0.6292$, find $\log \sqrt{x}$  Ans...............

6 In triangle $ABC$, $A = 40°$, $C = 90°$ and $BC = 11.5$; find $AC$ correct to the *nearest tenth*.  Ans...............

7 Write the formula expressing the relationship between $x$ and $y$ as shown by the following table:

| $x$ | 0 | 3 | 6 | 9 | ... |
|---|---|---|---|---|---|
| $y$ | −1 | 5 | 11 | 17 | ... |

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

8 One root of the equation $x^2 - 2x + c = 0$ is $1 - \sqrt{3}$; what is the other root?  Ans...............

9 Express in terms of the imaginary unit $i$ the sum of $2\sqrt{-9}$ and $\sqrt{-25}$  Ans...............

10 What is the slope of the line whose equation is $y - 3x = 4$?  Ans...............

11 Solve for $x$ the following equation: $\sqrt{x^2 + 11} = x + 1$  Ans...............

12 Find the value of $27^{\frac{2}{3}} - (3x)^0 + 25^{-\frac{1}{2}}$  Ans...............

13 Given the formula $L = \dfrac{Mt - g}{g}$; express $M$ as a function of $L$, $t$ and $g$; that is, solve the formula for $M$.  Ans...............

14 Write the first *two* terms of the expansion $(1 + \dfrac{5}{2x})^6$  Ans...............

15 The roots of the equation $4x^2 - 3x + 1 = 0$ are (a) real and equal, (b) real, rational and unequal, (c) real, irrational and unequal or (d) imaginary; which is correct, (a), (b), (c) or (d)?  Ans...............

16 In the formula $d = \dfrac{1}{t^2}$, if $t$ is doubled, then $d$ is (a) doubled, (b) multiplied by 4, (c) divided by 2 or (d) divided by 4; which is correct, (a), (b), (c) or (d)?  Ans...............

17 Factor completely $x^{n+2} + x^{n+1} - 6x^n$  Ans...............

18 Simplify $\dfrac{1 - \dfrac{y^2}{x^2}}{1 + \dfrac{y}{x}}$  Ans...............

19 Combine into a single term $\frac{1}{3}\sqrt{18} - 2\sqrt{\frac{1}{8}}$  Ans...............

20 The average of three numbers is $a$.  The first and second numbers are equal and the third is 12 more than the first; what is the third number?  Ans...............

[2]

## 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 $2x^2 + 3x - 8 = 0$    [10]

22 Solve the following set of equations for $x$ and $y$, correctly group your answers and check one pair:

$$x^2 + y^2 = 26$$
$$y = x + 4 \qquad [7, 1, 2]$$

23 Mr Brown starts from a certain point on a road leading due east at the same time that Mr Jones starts from the same point on a road leading due north. Mr Jones travels 7 miles an hour faster than Mr Brown. At the end of the first hour they are 13 miles apart. Find Mr Brown's rate of traveling.    [7, 3]

24 A man has a certain amount of money. He invests part of it at 4% and the rest at 5%. The combined annual income from both investments is $750. If the rate of interest on each investment were 1% greater, the total annual income would be $165 greater. How much does he invest at 4%?    [7, 3]

25 Find by the use of logarithms the value of

$$\frac{29.76 \times \sin 53°}{\sqrt[3]{823}} \qquad [10]$$

26 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* The sum of the two digits of a number is 15. If the digits are interchanged, the resulting number will exceed the given number by 27. Find the number.    [5]

    *b* The sum of the first three terms of an arithmetic progression beginning with $\frac{3}{2}$ is equal to the sum of the first three terms of a geometric progression beginning with $\frac{3}{2}$. The common difference is equal to the common ratio. What are the two series?    [5]

    *c* Two laborers together completed a job in 20 days. If the slower laborer had worked twice as fast, they would have completed the job in 15 days. How long would it have taken each laborer alone to do the job?    [5]

27 Under normal conditions, the distance that an automobile covers from the moment that brakes are applied until it comes to a full stop is given by the formula $d = \frac{1}{20} v^2$, where $d$ is the distance in feet and $v$ the number of miles an hour at which the automobile is traveling.

    *a* Using the horizontal axis to represent $v$ and the vertical axis to represent $d$, plot the graph of this formula as $v$ varies from 10 miles an hour to 60 miles an hour in intervals of 10.    [6]

    *b* From the graph made in answer to *a* determine the stopping distance if the car is going 35 miles an hour.    [2]

    *c* From the graph determine the speed at which the car is traveling if it can be brought to a stop in 100 feet.    [2]

*28 At noon A starts from a certain town T and walks along a road at the rate of 4 miles an hour until 3:30 p. m. He rests until 4 p. m. and then continues at the rate of 3 miles an hour. B sets out from T along the same road on a bicycle at 3 p. m. and travels at a uniform rate. He passes A at 5 p. m.

    a On the same set of axes represent these facts graphically for the interval from noon to 6 p. m. inclusive.   [7]

    b From the graph made in answer to a determine

        (1) The rate at which B is traveling.   [2]

        (2) How far apart A and B are at 6 p. m.   [1]

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