MATHEMATICS — Third Year

Thursday, January 26, 1933 — 9.15 a. m. to 12.15 p. m., only

Instructions

Do not open this sheet until the signal is given.

Answer all questions in part I and five questions from part II.

Part I is to be done first and the maximum time to be allowed for this part is one and one half hours. Merely write the answer to each question in the space at the right; no work need be shown.

If you finish part I before the signal to stop is given you may begin part II. However, it is advisable to look your work over carefully before proceeding to part II, since *no credit will be given any answer in part I which is not correct and reduced to its simplest form.*

When the signal to stop is given at the close of the one and one half hour period, work on part 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.

In this examination the customary lettering is used. *A*, *B* and *C* represent the angles of a triangle *ABC*; *a*, *b* and *c* represent the respective opposite sides. In a right triangle, *C* represents the right angle.

Give special attention to neatness and arrangement of work.

In both parts of this examination the use of the slide rule will be allowed for checking; in part II 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.

Part I

Answer all questions in this part. Each question has $2\frac{1}{2}$ credits assigned to it; no partial credit should be allowed. Each answer must be reduced to its simplest form.

1 Write in simplest form the value of $4^{\frac{1}{2}} \times 2y^0$ *Ans*............

2 Write the *sixth* term of the expansion $(3x - y)^7$ *Ans*............

3 What term of the progression 7, 4, 1, ... is —65?   *Ans*............

4 Solve for x the following equation: $2x = \frac{1}{x} + \frac{7}{2}$ *Ans*............

5 Solve for x the following equation: $\sqrt{4x^2 + 5} + 2x = 1$ *Ans*............

6 Write in the form $ax^2 + bx + c = 0$ the equation whose roots are $1 + \sqrt{3}$ and $1 - \sqrt{3}$ *Ans*............

7 Make a formula for the cost (C) of riding m miles in a taxicab at the rate of 25 cents for the first $2\frac{1}{2}$ miles and f cents for each succeeding half mile.   *Ans*............

8 Solve for x, correct to the *nearest tenth*: $10^x = 28$ *Ans*............

9 Write in exponential form: $\log_{10} R = K$ *Ans*............

10 Simplify $\dfrac{a - b}{\frac{a}{b} - \frac{b}{a}}$ *Ans*............

11 Find cot $37° 28'$ *Ans*............

12 Find to the *nearest minute* the smallest positive value of A if $\log \sin A = 9.8621 - 10$ *Ans*............

13 If $\cos A = -\frac{5}{13}$ and A is in the second quadrant, find tan A.   *Ans*............

14 Solve for a positive value of x in the third quadrant: $\sin^2 x = \frac{1}{2}$ *Ans*............

15 If A is in the second quadrant and sin A increases, does A increase or decrease?   *Ans*............

16 Express in radical form the value of cot $300°$ *Ans*............

17 The length of a rectangle is 200 feet. If one of the angles between the diagonals is $140°$, find to the *nearest foot* the width of the rectangle.   *Ans*............

18 Express in terms of a single trigonometric function of $2A$: $\dfrac{\cos^2 A - \sin^2 A}{\sin A \cos A}$ *Ans*............

19 Find to the *nearest degree* the acute angle made with the x-axis by the graph of the equation $3x - 4y = 12$ *Ans*............

20 What is the largest positive value that cos $5A$ may have?   *Ans*............

[3]

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Write at top of first page of answer paper to part II (*a*) name of school where you have studied, (*b*) number of weeks and recitations a week in (1) elementary algebra, (2) mathematics, third year.

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

Part II

Answer five questions from this part, selecting three questions from group I and two from group II.

Group I
Answer three questions from this group.

21 An auditorium balcony is to seat 490 persons. The first row has 40 seats and each succeeding row has two more seats than the row in front of it. How many rows must there be? [10]

22 The hypotenuse of a right triangle is 26 and the sum of the other two sides is 34; find the length of the sides. [6, 4] [Algebraic solution required]

23 A man deposits $1000 in a savings bank on the day when his son is born. With interest at 4% compounded semiannually, how much should the son receive at the end of his twenty-first year? [10]

24 A dealer bought some melons for $1.04. After throwing away 4 that were bad, he sold the rest at 6 cents apiece more than he paid for them and made a total profit of 22 cents. How many melons did he buy? [7, 3]

*25 Determine graphically whether the following equations have any common solutions:

$$y = 2^x$$
$$2y = x \quad [10]$$

Group II
Answer two questions from this group.

26 The distance from A to a point C due west of A is known to be less than 500 feet. Previous measurements from a point B have given $BA = 675.8$ feet, $BC = 610.3$ feet; the bearing of B from A is N. 48° 37′ W. Find the distance AC correct to the *nearest tenth of a foot.* [10]

27 Determine to the *nearest degree* the positive value of A less than 180° that satisfies the equation $4 \sin A - 7 \cos A = 1$ [10]

28 A tower 100 feet high stands on the seashore. From its top the angle of depression of a boat is 18° 40′. The distance from the foot of the tower to an island is 704 feet. Find the distance from the boat to the island if this distance subtends at the foot of the tower a horizontal angle of 107°. [10]

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