

The University of the State of New York

251ST HIGH SCHOOL EXAMINATION

MATHEMATICS—Third Year

Thursday, June 18, 1931 — 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.

MATHEMATICS — Third Year

Thursday, June 18, 1931

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 2½ credits assigned to it; no partial credit should be allowed. Each answer must be reduced to its simplest form.

1 Solve for x : $3x^2 - 5x = 2$ Ans.

2 Write a simple formula in terms of w and h from which, by substitution, the following table could have been obtained:

w	1	2	3	4	5
h	3	5	7	9	11

Ans.

3 Solve for n the formula $C = \frac{En}{R + nr}$ Ans.

4 Write a quadratic equation with integral coefficients whose roots are 2 and $\frac{1}{3}$. Ans.

5 Find the logarithm of 38.476 Ans.

6 Give the name of the curve that is the graph of the equation $y = x^2 - 4x - 2$ Ans.

7 Arrange the terms of the following expression in *descending* powers of x : $\frac{5}{x-1} + \frac{4}{x} + 1$ Ans.

8 Find the 101st term of the series 2, 5, 8, 11, Ans.

9 Express .2222 . . . as a common fraction. Ans.

10 Find the value of $16^{-\frac{1}{2}}$ Ans.

11 Rationalize the denominator of $\frac{1}{3 - \sqrt{3}}$ Ans.

12 Find the smallest positive angle A for which $\sin A = \cos A$. Ans.

13 Express $\cot 82^\circ$ as a function of an angle less than 45° . Ans.

14 Name the two trigonometric functions that are positive in the fourth quadrant. Ans.

15 If a , b , A and B are parts of an oblique triangle ABC , express a in terms of b and functions of A and B . Ans.

16 Find $\log \sin 59^\circ 17' 40''$ Ans.

17 What function of an acute angle x could increase from $\frac{1}{2}$ to 2 as x increases? Ans.

18 If $\tan x = -\frac{4}{3}$, and x is in the second quadrant, find the value of $\sec x$. Ans.

19 Find $\cos A$ if $a = 4$, $b = 5$ and $c = 6$, where A , a , b and c are parts of a triangle ABC . Ans.

20 Find the height of a tower if the angle of elevation of its top as seen from a point 1000 feet horizontally from its base is $27^\circ 18'$. Ans.

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 A man has \$10,000 invested at 4%. How much more must he invest at 6% in order to realize the equivalent of 5% on his total investment? [7, 3]

22 A milkman has 2000 pounds of milk which tests 5% butter fat, but the law requires only 4% butter fat; how many pounds of butter fat may he remove? [7, 3]

23 A rectangular piece of tin is twice as long as it is wide. If a square 2 inches on a side is cut from each corner and the tin folded up to make a box, the volume is 96 cubic inches. What are the dimensions of the piece of tin? [7, 3]

24 a Plot on the same set of axes two graphs of $y = mx$; first, when $m = 1$, and second, when $m = 3$ [7]

b Describe the change that takes place in the graph as m increases from 1 to 3. [3]

Group II

Answer two questions from this group.

25 Using logarithms, find B and C , if $b = 5196$, $c = 3842$ and $A = 72^\circ 38'$, where A , B , C , b and c are parts of an oblique triangle ABC . [10]

26 An observer at A notes that the angle of elevation of the top of a mountain is $17^\circ 16'$. He travels horizontally toward the mountain 2000 feet to B where he finds that the angle of elevation is $31^\circ 42'$. How far is B from the top of the mountain? [10]

27 Answer both a and b :

a Prove the identity: $\sin x \tan x + \cos x = \sec x$ [4]

b Find two values of x less than 360° and not negative that satisfy the equation $3 \tan x - 2 \sin x = 0$. [6]

The following question is based on optional topics in the syllabus and may be substituted for any other question in part II.

28 Answer both a and b :

a Find in radical form the sine of 75° . [5]

b Factor $x^3 - 2x^2 - 9$ [5]

207