The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TRIGONOMETRY

Wednesday, August 21, 1957 — 12 m. to 3 p.m., only

Fill in the following lines:

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

Part I

Answer all questions in this part. Each correct answer will receive 2½ credits. No partial credit will be allowed. Unless otherwise specified, answers may be left in terms of π or in radical form.

1 Express cos 332° as a function of a positive acute angle. 1.....

2 Change 108° to radians. 2.....

3 In a circle, a central angle of $\frac{4}{3}$ radians intercepts an arc of 2 inches. Find the radius of the circle in inches. 3.....

4 If A is a positive acute angle, express sin A in terms of sec A. 4.....

5 If A is a positive acute angle and $A = \text{arc cos } \frac{7}{9}$, find tan A. 5.....

6 In triangle ABC, $a:b = 3:4$ and $A = 30°$. Find sin B. 6.....

7 In triangle ABC, $a = 6$, $b = 10$ and cos $C = \frac{1}{8}$. Find c. 7.....

8 In triangle ABC, $a = 7$, $b = 5$ and $C = 60°$. Find tan $\frac{1}{2}(A - B)$. 8.....

9 If A and B are acute angles, $\sin A = \frac{1}{\sqrt{65}}$ and $\sin B = \frac{4}{\sqrt{65}}$, find $\sin (A + B)$. 9.....

10 If θ is an acute angle and $\cos \theta$ is $\frac{1}{49}$, find $\cos \frac{1}{2}\theta$. 10.....

11 Find the number of degrees in the smallest positive value of x if $\tan 4x = \cot 42°$. 11.....

12 What trigonometric function of x, other than $\cos x$ and $\tan x$, increases as x increases from 180° to 270°? 12.....

13 Find the logarithm of 0.8443. 13.....

14 Find cot 58° 24′. 14.....

15 Find, to the *nearest minute*, the positive acute angle A if $\log \sin A = 9.8567 - 10$. 15.....

16 The area of triangle ABC is 12. If $a = 8$ and $b = 5$, find $\sin C$. 16.....

17 Two forces of 3 pounds and 10 pounds act upon a body at right angles. Find, to the *nearest degree*, the angle that the resultant makes with the larger force. 17.....

18 Find, to the *nearest degree*, a value of x between 0° and 90° that satisfies the equation $\tan^2 x - 0.49 = 0$. 18.....

Directions (19–20): Indicate the correct completion for *each* of the following by writing on the line at the right the letter *a*, *b*, *c* or *d*.

19 The expression $\cos^2\theta\,(1 - \tan^2\theta)$ is equal to (*a*) $\sin 2\theta$ (*b*) $\cos 2\theta$ (*c*) $\tan 2\theta$ (*d*) $\sec 2\theta$ 19.....

20 In triangle ABC, values are given to a and b and angle B such that two triangles can be constructed. If $a = 12$, $B = 64° 10'$, then b may be equal to (*a*) 13 (*b*) 12 (*c*) 11 (*d*) 10 20.....

Part II

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

21 Find *all* positive values of x less than 360° that satisfy the equation $6\cos^2 x = 7 - 5\sin x$. Express approximate values of x to the *nearest degree.* [10]

22 *a* *Derive* the law of sines. [Consider only the case in which the triangle is acute.] [5]

b *Prove* the identity: $\dfrac{\csc^2 A}{\sin A + \cos A \cot A} = \cot A \sec A$ [5]

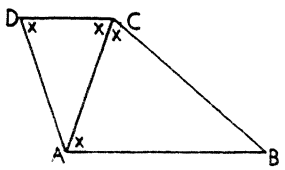
23 *a* On the same set of axes *sketch* the graphs of $y = 2\sin x$ and $y = \cos 2x$ from $x = -\dfrac{\pi}{2}$ to $x = +\dfrac{\pi}{2}$. [4, 4]

b From the graphs made in answer to part *a*, determine the number of values of x that satisfy the equation $\cos 2x - 2\sin x = 0$ when x is between $-\dfrac{\pi}{2}$ and $+\dfrac{\pi}{2}$. [2]

24 In the figure at the right, angles ADC, DCA, CAB and ACB are each represented by x. Show that

(*a*) $DC = 2AC\cos x$ [5]

(*b*) $DC = 4AB\cos^2 x$ [5]



25 Find all positive values of x less than 360° that satisfy the equation $2\left(\dfrac{\cos 5x + \cos 3x}{\sin 5x - \sin 3x}\right) + \tan x = 3$. Express approximate values of x to the *nearest degree.* [10]

Part III

Answer two questions from this part. Show all work.

26 In triangle ABC, $a = 112$, $b = 137$ and $c = 151$. Find angle B to the ***nearest ten minutes.*** [10]

27 Airfield A is N 10° W from airfield B. Airfield C is S 63° W from A and N 69° W from B. If A is 139 miles from B, find, to the *nearest mile*, the distance from B to C. [5, 5]

28 A vertical pole 19 feet high is located at the foot of a hill. From the top of the hill, the angles of depression of the top and the bottom of the pole are 42° 30′ and 47° 50′. Find, to the *nearest ten feet,* the height of the hill. [5, 5]

29 The points A and B on opposite sides of a hill are both visible from point C. If AC is 1,620 feet, BC is 2,240 feet and angle ACB is 82° 40′, find angle CBA to the *nearest ten minutes.* [10]

FOR TEACHERS ONLY

INSTRUCTIONS FOR RATING
TRIGONOMETRY

Wednesday, August 21, 1957 — 12 m. to 3 p.m., only

Use only *red* ink or pencil in rating Regents papers. Do not attempt to *correct* the pupil's work by making insertions or changes of any kind. Use check marks to indicate pupil errors.

Unless otherwise specified, mathematically correct variations in the answers will be allowed. In problems involving logarithms, answers should be left correct to four significant digits unless directions say otherwise. Units need not be given when the wording of the questions allows such omissions.

Part I

Allow $2\frac{1}{2}$ credits for each correct answer; allow no partial credit. Do not allow credit if the answers to questions 13 and 14 are not expressed to *four decimal places*. For questions 19–20, allow credit if the pupil has written the correct answer instead of the letter *b* or *c*.

(1) $\cos 28°$ *or* $\sin 62°$

(2) $\frac{3\pi}{5}$ *or* 1.9

(3) $1\frac{1}{2}$

(4) $\frac{\sqrt{\sec^2 A - 1}}{\sec A}$ *or* $\sqrt{1 - \frac{1}{\sec^2 A}}$

(5) $\frac{\sqrt{32}}{7}$ *or* $\frac{4\sqrt{2}}{7}$ *or* 0.8

(6) $\frac{2}{3}$

(7) 11

(8) $\frac{\sqrt{3}}{6}$ *or* 0.3

(9) $\frac{39}{65}$

(10) $\frac{5}{7}$

(11) 12

(12) csc x *or* csc

(13) 9.9265–10 *or* $\bar{1}$.9265

(14) 0.6152

(15) 45° 58′

(16) $\frac{3}{5}$

(17) 17°

(18) 35°

(19) *b*

(20) *c*