The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TRIGONOMETRY

Wednesday, January 22, 1958 — 9:15 a.m. to 12:15 p.m., only

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 tan 195° as a function of a positive acute angle. 1.....

2 Express 0.4 radians to the *nearest degree*. 2.....

3 Find the number of radians in a central angle which intercepts an arc whose length is 3.2 times the radius of the circle. 3.....

4 Find the *positive* value of sin (arc tan $\frac{2}{\sqrt{5}}$). 4.....

5 In triangle ABC, $a = 3$, $b = 4$ and $c = 5$. Find the sine of the largest angle of this triangle. 5.....

6 Find the antilogarithm of 3.2918. 6.....

7 Find cos 40° 17′. 7.....

8 Find, to the *nearest minute*, the positive acute angle A if log sin $A = 9.9067 - 10$. 8.....

[OVER]

135

9 Point B is due east of A. Point C is N 48° E from A and 100 miles due north of B. Find, to the *nearest mile*, the distance from A to B. 9.....

10 In triangle ABC, $\sin A = \frac{3}{5}$, $\sin B = \frac{8}{17}$ and $a = 15$. Find b. 10.....

11 In triangle ABC, $\frac{1}{2}(A + B) = 58° 10'$ and $\frac{1}{2}(A - B) = 16° 30'$. Find B. 11.....

12 Express $\tan(x + y)$ in terms of $\tan x$ and of $\tan y$. 12.....

13 If x is a positive acute angle and $\sin x = \frac{2}{\sqrt{13}}$, find $\sin 2x$. 13.....

14 If x is a positive acute angle and $\cos x = a$, express $\cot x$ in terms of a. 14.....

Directions (15–20): Indicate the correct completion for *each* of the following by writing the letter a, b, c or d on the line at the right.

15 In triangle ABC, $a = 5$, $b = 7$ and $c = 8$. The cosine of angle C is (a) $\frac{1}{7}$ (b) $\frac{3}{7}$ (c) $\frac{1}{10}$ (d) $\frac{7}{8}$ 15.....

16 If $\log x = a$ and $\log y = b$, $\log \frac{x^2}{y}$ is equal to (a) $a^2 - b$ (b) $2a - b$ (c) $\frac{2a}{b}$ (d) $2(a - b)$ 16.....

17 A value that satisfies the equation $\cos^2 x - 2\cos x = 0$ is (a) 0° (b) 30° (c) 60° (d) 90° 17.....

18 The expression $\frac{\sin(90° + x)}{\sin(-x)}$ can be reduced to (a) -1 (b) 1 (c) $-\cot x$ (d) $\cot x$ 18.....

19 The minimum value of $2\sin 2x$ is (a) 0 (b) -1 (c) -2 (d) -4 19.....

20 Which of the following equations is an identity? (a) $\sin^2 2A + \cos^2 2A = 1$ (b) $\sin^2 2A + \cos^2 2A = 2$ (c) $\sin^2 A - \cos^2 A = 1$ (d) $\sin A + \cos A = 1$ 20.....

Part II

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

21 Find all positive values of A less than 360° which satisfy the equation $7 \sin A + 1 = 6 \csc A$. [Express approximate values to the *nearest degree.*] [10]

22 *Derive* the formula for $\sin(x + y)$ in which x, y and $(x + y)$ may be assumed to be positive acute angles. [10]

23 *a* On the same set of axes, *sketch* the graphs of $y = \sin x$ and $y = \cos \frac{1}{2}x$ as x varies from 0 to 2π radians. [4, 4]

b From the graphs made in answer to part *a*, determine the quadrant in which $\sin x - \cos \frac{1}{2}x$ is always positive. [2]

24 *a* Prove the identity: $\cot \theta - \dfrac{\cos 2\theta}{\sin \theta \cos \theta} = \tan \theta$ [6]

b Show that the expression $\dfrac{\sin 3x + \sin x}{\cos 3x + \cos x}$ may be reduced to the form $\tan 2x$. [4]

25 Answer both *a* and *b* without the use of trigonometric tables.

a Angle x is acute, angle y is obtuse, $\cos x = \dfrac{15}{17}$ and $\sin y = \dfrac{3}{5}$. Find $\sin (x - y)$. [5]

b Angle x is in quadrant IV. If $\tan x = \dfrac{-24}{7}$, find $\cos \frac{1}{2}x$. [5]

Part III

Answer two questions from this part. Show all work.

26 In triangle ABC, angle $A = 42°$, angle $C = 115°$ and side $AC = 32.6$. Find, to the *nearest tenth,* the length of the altitude drawn from B to side AC extended. [10]

27 Town B is 25.7 miles due east of town A and town C is farther south than either B or A. The distance from A to C is 29.3 miles and from B to C is 36.8 miles. Find, to the *nearest degree,* the direction of C from A. [4, 5, 1]

28 Forces of 213 pounds and 378 pounds act upon a body at an angle of 68° with each other. Find, to the *nearest degree,* the angle which the resultant makes with the greater force. [10]

29 Highway engineers plan to eliminate a curve in a road between two points A and B, which are on opposite sides of a hill, by building a straight tunnel through the hill from A to B. From a point C on top of the hill, 290 yards from A, the angles of depression of A and B are 28° 10′ and 36° 20′, respectively. If A and B are at the same level and if A, B and C are in the same vertical plane, find the length of the proposed tunnel to the *nearest ten yards.* [6, 4]

FOR TEACHERS ONLY

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INSTRUCTIONS FOR RATING
TRIGONOMETRY

Wednesday, January 22, 1958 — 9:15 a.m. to 12:15 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 answer to question 7 is not expressed to *four decimal places* and if the answer to question 6 is not expressed to *four significant digits*. For questions 15–20, allow credit if the pupil has written the correct answer instead of the letter *a*, *b*, *c* or *d*.

(1) $\tan 15°$ *or* $\cot 75°$

(2) 23

(3) 3.2

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

(5) 1

(6) 1958

(7) 0.7629

(8) $53° 47'$

(9) 111

(10) 9

(11) $41° 40'$

(12) $\dfrac{\tan x + \tan y}{1 - \tan x \tan y}$

(13) $\dfrac{12}{13}$

(14) $\dfrac{a}{\sqrt{1 - a^2}}$

(15) *a*

(16) *b*

(17) *d*

(18) *c*

(19) *c*

(20) *a*