The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

TRIGONOMETRY

Wednesday, August 24, 1960 — 12 m. to 3 p.m., only

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

Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Unless otherwise specified, answers may be left in terms of π or in radical form.

1 Express sec 100° as a function of a positive acute angle. 1...............

2 Find the numerical value of $\sin \frac{\pi}{6} + \cos 2\pi$. 2...............

3 Find to the *nearest minute* the positive acute angle whose sine is 0.3808. 3...............

4 Find log cos 61° 32′. 4...............

5 Find the number of degrees in an acute angle that satisfies the equation $\sin B = \cos 2B$. 5...............

6 Express $\frac{\tan A}{\sec A}$ in terms of $\sin A$. 6...............

7 An angle in standard position has its terminal side passing through the point (0, —2). Find the value of the cosine of this angle. 7...............

8 In triangle ABC, $b = 10$, $c = 12$ and $\cos A = 0.20$. Find a. 8...............

9 In triangle ABC, $a = 30$, $\sin A = 0.81$ and $\sin B = 0.31$. Find to the *nearest integer* the length of side b. 9...............

10 Find the number of inches in the radius of a circle in which a central angle of 2 radians intercepts an arc of 16 inches. 10...............

11 Find the positive value of sin (arc cos x). 11...............

12 If $\cos 2\theta$ is represented by x, express $\sin^2\theta$ in terms of x. 12...............

13 If $\tan \theta = \frac{1}{2}$, find the numerical value of $\tan 2\theta$. 13...............

14 If $\tan \theta$ is represented by x, express $\sec^2\theta$ in terms of x. 14...............

15 Find to the *nearest degree* the number of degrees in an angle of 1.5 radians. 15...............

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16 If $\cos x = \frac{7}{25}$, find the positive value of $\cos \frac{1}{2}x$. 16...............

17 If A is a quadrant I angle whose cosine is $\frac{4}{5}$ and B is a quadrant II angle whose cosine is $-\frac{4}{5}$, find the value of $\sin(A + B)$. 17...............

18 Express $\cos 100° + \cos 50°$ as an equivalent product of trigonometric functions. 18...............

19 In triangle ABC, $a = 10$, $C = 60°$ and the area of the triangle $= 40\sqrt{3}$. Find b. 19...............

20 Simplify: $\dfrac{\cos(90° + A)}{\sin(-A)}$ 20...............

Directions (21–30): Write on the line at the right of *each* of the following the *number* preceding the expression that best completes the statement.

21 For all values of A, $\cos(-A)$ equals
(1) $\sin A$ (2) $-\sin A$ (3) $\cos A$ (4) $-\cos A$ 21...............

22 The period of the function $\frac{1}{2}\sin 2x$ is
(1) 1 (2) $\frac{1}{2}$ (3) π (4) 2π 22...............

23 The expression $\dfrac{1}{1 - \sin x} + \dfrac{1}{1 + \sin x}$ is equivalent to
(1) 1 (2) $2\sec^2 x$ (3) $2\cos^2 x$ (4) $\dfrac{2}{\cos^2 x - 1}$ 23...............

24 If $y = 2\sin x$, a value of x which gives a maximum value for y is
(1) 45° (2) 90° (3) 180° (4) 270° 24...............

25 In triangle ABC, $A = 105°$ and $B = 15°$. The ratio $\dfrac{a - b}{a + b}$ is
(1) $1:\sqrt{2}$ (2) $1:\sqrt{3}$ (3) $\sqrt{3}:1$ (4) $3:4$ 25...............

26 The set of all positive values of x less than 360° which satisfies the equation $(2\cos x - 1)(\cos x + 1) = 0$ consists of three members. Two of these are 60° and 180°. The remaining one is
(1) 120° (2) 210° (3) 240° (4) 300° 26...............

27 As x increases from 0° to 360°, the number of times the graphs of $y = \sin x$ and $y = \cos x$ intersect is
(1) 1 (2) 2 (3) 3 (4) 4 27...............

28 In triangle ABC, $C = 90°$. If $\tan A$ is represented by x and side AC is represented by $3x$, side CB equals
(1) $3x$ (2) $3x^2$ (3) 3 (4) $\frac{1}{3}$ 28...............

29 If $\log \sin A = \log a - \log c$, then a equals
(1) $c \sin A$ (2) $\log c \sin A$ (3) $(\log c)(\log \sin A)$
(4) $c + \sin A$ 29...............

30 Using the data $A = 30°$, $a = 10$ and $b = 20$,
(1) one isosceles triangle can be constructed
(2) one acute triangle and one obtuse triangle can be constructed
(3) one right triangle can be constructed
(4) no triangle can be constructed 30...............

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Part II

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

31 Two angles of a triangle are 142° 10′ and 24° 30′. The longest side of the triangle is 962 centimeters. Find, to the *nearest centimeter*, the length of the *shortest* side of the triangle. [10]

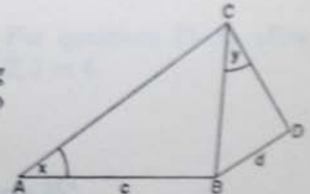
32 Prove the identities:

a $(1 + \cos x)(\csc x - \cot x) = \sin x$ [5]

b $\dfrac{\sin 2A}{1 + \cos 2A} = \tan A$ [5]

33 *a* Starting with the formula for $\cos (x + y)$, *derive* the formula for $\cos 2x$ in terms of $\sin x$. [5]

b In the accompanying diagram $CB \perp AB$ and $CD \perp BD$. Using the letters as shown on the diagram, *derive* the relationship $d = c \tan x \sin y$. [5]



34 Find all positive values of A less than 360° which satisfy the equation $\sin^2 A + 1 = \cos A\,(1 + 2 \cos A)$. [Express approximate values to the *nearest degree*.] [10]

35 *a* On the same set of axes *sketch* the graphs of $y = 2 \sin x$ and $y = \cos 2x$ as x varies from $-\pi$ to π. [4, 4]

b State the minimum value of the function $\cos 2x$. [2]

36 The diagonals of a parallelogram are 18 and 30, and they intersect at an angle of 60°.

a Find the area of the parallelogram. [5]

b Find the length of a longer side. [5]

[Answers may be left in radical form.]

FOR TEACHERS ONLY

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INSTRUCTIONS FOR RATING

TRIGONOMETRY

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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 checkmarks 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 credits for each correct answer; allow no partial credit. For questions 21–30, allow credit if the pupil has written the correct answer instead of the number 1, 2, 3 or 4.

(1) $-\sec 80°$ *or* $-\csc 10°$

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

(3) 22° 23′

(4) 9.6782 — 10

(5) 30

(6) $\sin A$

(7) 0

(8) 14

(9) 11

(10) 8

(11) $\sqrt{1-x^2}$

(12) $\dfrac{1-x}{2}$

(13) $\dfrac{4}{3}$

(14) $1+x^2$

(15) 86

(16) $\frac{4}{5}$

(17) 0

(18) $2\cos 75° \cos 25°$

(19) 16

(20) 1

(21) 3

(22) 3

(23) 2

(24) 2

(25) 2

(26) 4

(27) 2

(28) 2

(29) 1

(30) 3

Please refer to the Department's pamphlet *Suggestions on the Rating of Regents Examination Papers in Mathematics.* Care should be exercised in making deductions as to whether the error is purely a mechanical one or due to a violation of some principle. A mechanical error generally should receive a deduction of 10 percent, while an error due to a violation of some cardinal principle should receive a deduction ranging from 30 percent to 50 percent, depending on the relative importance of the principle in the solution of the problem.

Part II

(31) 362 [10]

(34) 48°, 180°, 312° [10]

(35) *b* —1 [2]

(36) *a* $135\sqrt{3}$ [5]
b 21 [5]