The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

11 ELEVENTH YEAR MATHEMATICS

Monday, January 27, 1969 — 1:15 to 4:15 p.m., only

The last page of the booklet is the answer sheet, which is perforated. Fold the last page along the perforation and then, slowly and carefully, tear off the answer sheet. Now fill in the heading of your answer sheet. When you have finished the heading, you may begin the examination immediately.

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. Write your answers in the spaces provided on the separate answer sheet.

1 If the number 0.00000084 is expressed in the form 8.4×10^a, what is the value of a?

2 For what value of b will the equation $bx^2 - bx - 2 = 0$ have 2 as a root?

3 Express $2\sqrt{-25} - \sqrt{-1}$ as a monomial in terms of i.

4 Write as a product of two binomials:
$$6 \tan^2 x - 19 \tan x + 10$$

5 Solve the following system of equations for x and y:
$$2x - 5y + 1 = 0$$
$$3x - 2y + 7 = 0$$

6 Solve for M: $F = \dfrac{GMN}{D^2}$

7 Find the logarithm of 36.83.

8 Express in *simplest* form: $\dfrac{\dfrac{b}{a} - \dfrac{a}{b}}{\dfrac{1}{a} - \dfrac{1}{b}}$

9 Express $\dfrac{5}{3 - \sqrt{2}}$ as an equivalent fraction with a rational denominator.

10 The bottom of a pendulum describes an arc 3 feet long when the pendulum swings through an angle of $\frac{1}{2}$ radian. Find the length of the pendulum in feet.

11 What is the 51st term in the arithmetic progression whose first 3 terms are 20, 18, and 16, respectively?

12 In $\triangle ABC$, $a = 3$, $b = 8$, and angle $C = 60°$. Find the length of side c.

13 Find the positive numerical value of $\cos (\text{arc } \sin \frac{3}{5})$.

14 If A is a positive acute angle and $\sin A = \frac{1}{3}$, what is the value of $\sin 2A$ expressed in radical form?

15 If $\cos x = a$, express $\cos (180° - x)$ in terms of a.

[OVER]

16 Which equation has a hyperbola as its graph?
(1) $x^2 = 10 + y$
(2) $x^2 = 10 - y^2$
(3) $3x^2 = 10 - 2y^2$
(4) $3x^2 = 10 + 2y^2$

17 Which illustrates the associative property of addition?
(1) $(87 + 2)8 = 87 \cdot 8 + 2 \cdot 8$
(2) $(87 + 2) + 8 = 8 + (87 + 2)$
(3) $87(2 + 8) = 87 \cdot 2 + 87 \cdot 8$
(4) $(87 + 2) + 8 = 87 + (2 + 8)$

18 What is the y-intercept of the graph of $y = 2x^2 - 3x + 2$?
(1) 1
(2) 2
(3) 3
(4) -2

19 Which value of A satisfies the equation $\sqrt{\tan A} = 1$?
(1) $30°$
(2) $45°$
(3) $60°$
(4) $90°$

20 If in $\triangle ABC$, $\sin A = \frac{1}{4}$ and $\sin B = \frac{1}{2}$, what is the ratio of side a to side b?
(1) $\frac{1}{8}$
(2) 2
(3) $\frac{1}{4}$
(4) $\frac{1}{2}$

21 The value of $\tan \frac{\pi}{3}$ is equal to the value of
(1) $\tan \frac{2\pi}{3}$
(2) $\tan \frac{5\pi}{3}$
(3) $\cot \frac{\pi}{6}$
(4) $\cot \frac{5\pi}{6}$

22 The equation $\sqrt{x^2} = x$ is *not* satisfied by
(1) negative numbers
(2) zero
(3) positive integers
(4) positive irrational numbers

23 What is the value of the discriminant of the equation $x^2 + 3x + 4 = 0$?
(1) -7
(2) -5
(3) 5
(4) 25

24 If neither a nor b is zero, what is the slope of the line defined by the equation $ax + by = c$?
(1) $\frac{a}{b}$
(2) $\frac{c}{b}$
(3) $\frac{-a}{b}$
(4) $\frac{-b}{a}$

25 As angle A varies from $-\frac{\pi}{2}$ to 0 radians, then $\sin A$
(1) increases from 0 to 1
(2) increases from -1 to 0
(3) decreases from 0 to -1
(4) decreases from 1 to 0

26 What is the period of the graph of $y = \frac{1}{2} \sin \theta$?
(1) π
(2) 2π
(3) $\frac{1}{2}\pi$
(4) 4π

27 If $2^x = m$, then 2^{x+3} is equal to
(1) $8m$
(2) $6m$
(3) $m + 3$
(4) m^3

28 Other factors being equal, the lift angle of an airplane wing varies directly as the square of the velocity V of the plane.
If the velocity is doubled, the lift is
(1) divided by 2
(2) divided by 4
(3) multiplied by 2
(4) multiplied by 4

29 Using the data angle $A = 38°$, $b = 20$, and $a = 17$, the number of distinct triangles that can be constructed is
(1) one right triangle
(2) two triangles
(3) one oblique triangle
(4) none

30 The value of $\cos 295°$ is
(1) 0.4226
(2) 0.9063
(3) -0.4226
(4) -0.9063

Answers to the following questions are to be written on paper provided by the school.

Part II

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

31 *a* Solve for tan θ to the *nearest tenth*: [8]

$$2 \tan^2 \theta - 5 \tan \theta + 1 = 0$$

b How many different *acute* angles are there which satisfy the equation in part *a*? [2]

32 *a* Draw the graph of the equation $y = 5 - x^2$, using all integral values of x from $x = -3$ to $x = 3$, inclusive. [6]

b On the same set of axes used in part *a*, draw the graph of the equation $y = x + 3$. [2]

c From the graphs drawn in parts *a* and *b*, determine the number of points whose coordinates satisfy $y = 5 - x^2$ and $y = x + 3$. [2]

33 Using logarithms, find the value of x to the *nearest tenth*: [10]

$$x = 3.28 \sqrt[3]{\frac{690}{(0.417)(1.84)}}$$

34 Write an equation or a system of equations which can be used to solve *each* of the following problems. In each case state what the variable or variables represent. [*Solution of the equations is not required.*]

a Mr. Smith drove 3 hours at a uniform speed. During the next hour, he drove at one-half of his former speed. If he drove a total distance of 140 miles, what was Mr. Smith's original speed? [5]

b A group of fishermen chartered a boat for $300. Two members of the group were unable to go on the trip, and as a result, each of the others had to pay $5 more. How many men were in the original group? [5]

35 *a* Starting with the formula for cos $(x + y)$, derive a formula for cos $2x$ in terms of cos x. [4]

b Show that the following is an identity: [6]

$$\frac{\tan A + \sin A}{\csc A + \cot A} = \sin A \tan A$$

36 Answer *either a* or *b* but *not* both:

a The distances from boathouse C to two points, A and B, on the shore of a lake are 6.4 miles and 3.8 miles, respectively. If angle ACB measures $67°$ $40'$, find to the *nearest tenth* of a mile the distance between A and B. [4,6]

OR

b A ship at A is 80 miles due west of a ship at B. An S O S is received by both ships showing the bearing of a distressed ship to be N $72°$ E from A and N $65°$ W from B. Find to the *nearest mile* the distance from the distressed ship to the closer of the other two ships. [5,5]

*37 Two forces of 335 and 478 pounds, respectively, act on a body at an angle of $45°$ $40'$ with each other. Using the law of tangents, find to the *nearest ten minutes* the angle between the resultant and the greater force. [10]

* This question is based on an optional topic in the syllabus.

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ANSWER SHEET

Pupil..Teacher...

School...

Your answers to Part I should be recorded on this answer sheet.

Part I

Answer all questions in this part.

1.................................	11.................................	21.................................
2.................................	12.................................	22.................................
3.................................	13.................................	23.................................
4.................................	14.................................	24.................................
5.................................	15.................................	25.................................
6.................................	16.................................	26.................................
7.................................	17.................................	27.................................
8.................................	18.................................	28.................................
9.................................	19.................................	29.................................
10.................................	20.................................	30.................................

Your answers for Part II should be placed on paper provided by the school.

225

226

FOR TEACHERS ONLY

11

SCORING KEY
ELEVENTH YEAR MATHEMATICS

Monday, January 27, 1969 — 1:15 to 4:15 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 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 16–30, allow credit if the pupil has written the correct answer instead of the number 1, 2, 3, or 4.

(1) —7

(2) 1

(3) $9i$

(4) $(3 \tan x - 2)(2 \tan x - 5)$

(5) $x = -3, y = -1$ *or* $(-3, -1)$

(6) $\dfrac{FD^2}{GN}$

(7) 1.5662

(8) $b + a$

(9) $\dfrac{5(3 + \sqrt{2})}{7}$

(10) 6

(11) —80

(12) 7

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

(14) $\dfrac{\sqrt{3}}{2}$

(15) —a

(16) 4

(17) 4

(18) 2

(19) 2

(20) 4

(21) 3

(22) 1

(23) 1

(24) 3

(25) 2

(26) 2

(27) 1

(28) 4

(29) 2

(30) 1

[OVER]

Part II

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.

(31) *a* 2.3, 0.2 [8]
     b 2 [2]

(32) *c* 2 [2]

(33) 31.7 [10]

(34) *a* x = Mr. Smith's original speed

$$3x + \frac{x}{2} = 140 \qquad [5]$$

   b x = number of men originally
     y = amount each was to pay
       originally
     $xy = 300$
     $(x - 2)(y + 5) = 300$ [5]

(36) *a* Analysis [4]
     6.1 [6]

   b Analysis [5]
     36 [5]

*(37) 18° 40′ [10]