The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

11 ELEVENTH YEAR MATHEMATICS

Friday, June 18, 1971 — 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 A mother is 21 years older than her daughter, and the daughter is n years old. Express, in terms of n and x, the mother's age x years ago.

2 Solve for x: $3^{x+1} = 27$

3 Factor: $x^2 + 2x - 3(x + 2)$

4 In $\triangle ABC$, $c = 4$, $\sin A = 0.3$, and $\sin C = 0.6$. Find the numerical value of a.

5 What is the *smallest* integral value of x for which $\sqrt{3 - x}$ is imaginary?

6 How many distinct triangles can be constructed given $a = 7$, $b = 6$, and $m\angle A = 50$?

7 Find the positive value of $\tan\theta$ if $2\tan^2\theta + \tan\theta - 6 = 0$.

8 If x is a positive acute angle whose sine is $\frac{1}{2}$, find the value of $\sin 2x$.

9 If f is a function such that $f(x) = 3(x + 2)^2$, find $f(3)$.

10 What is the slope of the line whose equation is $2x + 3y + 4 = 0$?

11 Express in *simplest form*: $\dfrac{\dfrac{a+b}{a}}{\dfrac{1}{a} + \dfrac{1}{b}}$

12 Find $\sin(\text{Arc}\tan \frac{3}{4})$.

13 In $\triangle ABC$ if $a = 6$, $b = 10$, and $m\angle C = 30$, what is the area of the triangle?

14 If $n = \sqrt[3]{2.15}$, find $\log n$ to *four decimal places.*

15 In $\triangle ABC$, if $\cos C = \frac{2}{3}$, $a = 4$, and $b = 3$, find the numerical value of c.

Directions (16–30): Write in the space provided on the separate answer sheet the *number* preceding the expression that best completes *each* statement or answers *each* question.

16 For which values of x and y is it true that $|xy| > xy$?
(1) $x = 5$, $y = 6$
(2) $x = -7$, $y = -8$
(3) $x = -4$, $y = 3$
(4) $x = 0$, $y = 5$

17 If $\log 2 = A$, what is $\log 0.00002$ equal to?
(1) $A - 4$
(2) $4 - A$
(3) $A - 5$
(4) $5 - A$

18 The equation $y = \dfrac{1}{c^2 - 4}$ is meaningless if c is equal to
(1) 1
(2) −2
(3) 0
(4) 4

19 A circle has its center at the origin and has an x-intercept of 2. A point *not* on the circle is

(1) $(\sqrt{2},\sqrt{2})$ (3) $(1,\sqrt{3})$
(2) $(0,-2)$ (4) $(-1,3)$

20 The equation $\sqrt{x+11}+1=x$ is satisfied by

(1) both 5 and —2
(2) 5, only
(3) —2, only
(4) neither 5 nor —2

21 If x and y are related as in the table below, which is true?

x	5	10	20
y	25	100	400

(1) y varies directly as x.
(2) y varies inversely as x.
(3) y varies directly as the square of x.
(4) The relationship between x and y is not correctly stated in any of the above.

22 When $x = 8$, the value of $[(x^{-2})(27x^0)]^{\frac{1}{3}}$ is

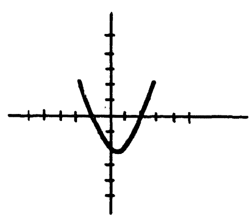
(1) ¾ (3) 12
(2) ⅛ (4) 4

23 In a circle, an arc of length 4 is intercepted by a central angle of ⅔ radians. The radius of the circle is

(1) $^{16}/_3$ (3) 3
(2) $^3/_{16}$ (4) 4

24 The diagram shown is a sketch of the graph of the equation $y = x^2 - x - 2$. The solution set of $x^2 - x - 2 = 0$ is $\{2,-1\}$. The solution set of $x^2 - x - 2 < 0$ consists of all x such that

(1) $x > 2$
(2) $x < -1$
(3) $x < -1$ or $x > 2$
(4) $-1 < x < 2$



25 If $(\tan x - 2)(\tan x - 1) = 0$, then x may be an angle whose terminal side lies in

(1) the first quadrant, only
(2) the first or third quadrants, only
(3) the second or fourth quadrants, only
(4) any of the four quadrants

26 As θ varies from $\frac{\pi}{2}$ to $\frac{3\pi}{2}$ radians, the value of the function $\sin\theta$ will

(1) increase, only
(2) increase, then decrease
(3) decrease, only
(4) decrease, then increase

27 An equation whose graph is a parabola passing through the point (0,1) is

(1) $y = x + 1$ (3) $y^2 = x^2 + 1$
(2) $y = x^2 + 1$ (4) $x^2 = y + 1$

28 If x is a positive acute angle, then $\tan(180° - x)$ is equal to

(1) $-\tan x$ (3) $\tan x$
(2) $-\cot x$ (4) $\cot x$

29 The numerical value of $\sin\frac{\pi}{2} + 2\sin\frac{\pi}{4}$ is

(1) $1+\sqrt{2}$ (3) $1+\frac{\sqrt{2}}{2}$
(2) $1-\sqrt{2}$ (4) $\frac{\sqrt{2}}{2}+2$

30 If the roots of a quadratic equation are real and equal, the discriminant of the equation has a value which is

(1) less than zero
(2) equal to zero
(3) greater than zero and a perfect square
(4) greater than zero but not a perfect square

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* Find, to the *nearest tenth,* the roots of the equation $3x^2 - 7x = 2$. [8]

b If $x = \sin \theta$ in the equation $3x^2 - 7x = 2$, determine the quadrant(s) in which angle θ lies. [2]

32 *a* On the same set of axes, sketch the graphs of $y = 2 \cos x$ and $y = \tan x$ for all values of x which are in the interval $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$. [4,4]

b From the graphs made in part (*a*), determine the number of values of x that satisfy the equation $\tan x = 2 \cos x$ in the interval $0 \leq x \leq \frac{\pi}{2}$. [2]

33 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 equations is not required.*]

a Bob takes 5 hours longer than Jack to complete a certain job. Together they can complete the job in 6 hours. Find the time it takes Jack to complete the job alone. [5]

b A car traveling at 50 m.p.h. can cover a certain distance in 20 minutes less time than when traveling at 45 m.p.h. Find the distance. [5]

34 *a* Starting with the formula for $\sin (x + y)$ *derive* the formula for $\sin (x - y)$. [3]

b Using the formula derived in part (*a*) for $\sin (x - y)$, express in radical form the value of $\sin 15°$ using function values of 45° and 30°. [3]

c For all θ for which the expression is defined, show that the following is an identity: [4]

$$\sec \theta - \sin \theta \tan \theta = \cos \theta$$

35 Using logarithms find, to the *nearest tenth,* the value of N if

$$N = 6.28 \sqrt{\frac{436 \cos 56° 20'}{98}}. \quad [10]$$

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

a Find to the *nearest degree* the measure of the angle between two forces of 30 lb. and 35 lb. if the magnitude of the resultant is 42 lb. [10]

OR

b From two points 250 yards apart on a horizontal (straight) road running directly toward the launch pad, the angles of elevation of the top of a rocket measure 44° and 28°. Find the height of the rocket to the *nearest ten yards.* [10]

*37 Three positive numbers are in the ratio 1 : 7 : 25. If 4 is added to each number, the resulting numbers form a geometric progression. Find the three numbers. [*Only an algebraic solution will be accepted.*] [5,5]

* Based on an optional topic in the syllabus.

FOR TEACHERS ONLY

11

SCORING KEY

ELEVENTH YEAR MATHEMATICS

Friday, June 18, 1971 — 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) $n + 21 - x$

(2) 2

(3) $(x - 3)(x + 2)$

(4) 2

(5) 4

(6) 1

(7) $1\frac{1}{2}$

(8) $\frac{\sqrt{3}}{2}$ *or* .866

(9) 75

(10) $-\frac{2}{3}$

(11) b

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

(13) 15

(14) 0.1108

(15) 3

(16) 3

(17) 3

(18) 2

(19) 4

(20) 2

(21) 3

(22) 1

(23) 3

(24) 4

(25) 2

(26) 3

(27) 2

(28) 1

(29) 1

(30) 2

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* 2.6, —0.3 [8]
b III and IV [2]

(32) *b* 1 [2]

(33) *a* x = number of hours it takes Jack to complete a job alone

$$\frac{6}{x} + \frac{6}{x + 15} = 1 \quad [5]$$

b x = number of miles in the distance covered

$$\frac{x}{50} + \frac{1}{3} = \frac{x}{45} \quad [5]$$

(34) *b* $\frac{\sqrt{6} - \sqrt{2}}{4}$ [3]

(35) 9.9 [10]

(36) *a* 100 [10]
b 300 [10]

*(37) Analysis [5]
2, 14, 50 [5]

DO YOU KNOW . . .

. . . that classroom teachers returned over 3,700 Regents examination evaluation forms to the Education Department last year? The comments and suggestions made by these teachers were carefully reviewed by the Department subject-matter and testing specialists and by the teachers who prepared this year's examinations.

Be sure to fill out the Evaluation Form and give it to your principal for return in the Regents box. Your comments about the Regents examinations are important! They will be taken into consideration when future examinations are prepared.