The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

INTERMEDIATE ALGEBRA

Monday, January 27, 1964 — 1:15 to 4:15 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.

1 Express $\dfrac{1}{3+\sqrt{3}}$ as an equivalent fraction having a rational denominator. 1................

2 Combine the following: $\sqrt{-9}+\sqrt{-16}$ 2................

3 Express as a single fraction: $\dfrac{3}{2x}-\dfrac{x}{6x-9}$ 3................

4 If $x=16$, evaluate $2x^{-\frac{1}{2}}-x^0$. 4................

5 Find the *larger* value of x which satisfies the equation $x^2-16=x-4$. 5................

6 Find n if $\log n = 8.6257-10$. 6................

7 If $\log 0.2$ is $9.3010-10$, find $\log\sqrt{0.2}$. 7................

8 If $\log x = 2\log A - \log B$, express x in terms of A and B. 8................

9 Solve for x: $a=b+\dfrac{1}{x}$ 9................

10 Express in *simplest* form: $\dfrac{1+\dfrac{b}{a-b}}{1-\dfrac{a}{a-b}}$ 10................

11 Write the term which involves a^3 in the expansion of $(a-2b)^5$. 11................

12 Express in *simplest* form:

$$\left(\frac{6a^2-7ab+2b^2}{5x}\right)\left(\frac{10x}{4a-2b}\right)$$

12................

13 The second term of a geometric progression is 8 and the third term is $\frac{16}{3}$. What is the first term? 13...............

14 The first term of an arithmetic progression is 10 and the third term is 9. Find the value of the 21st term. 14...............

15 A law of physics states that v, the velocity of a jet of liquid flowing through an opening, varies directly as the square root of h, the height of the surface of the liquid above the opening. If $h = 4$ feet, then $v = 16$ feet per second. If $h = 36$ feet, find the velocity in feet per second. 15...............

16 If the two roots of the equation $x^2 + kx + m = 0$ are $(2 + \sqrt{3})$ and $(2 - \sqrt{3})$, find the value of m. 16...............

17 Write an equation of the line whose slope is $\frac{2}{3}$ and whose y-intercept is -4. 17...............

18 If the units digit of a two-digit number is represented by a and the tens digit by $a + 2$, express the number in terms of a. 18...............

19 If the ordinate of a point on the curve $xy = 12$ is 8, write the coordinates of this point. 19...............

20 Write an equation of the axis of symmetry of the graph of the equation $y = x^2 - 2x - 15$. 20...............

21 The base of an isosceles triangle is 10 and its altitude is 12. Find to the *nearest degree* the angle between the base and one of the equal sides. 21...............

22 Find the numerical value of k if the point $(2, 9)$ lies on the graph of the equation $y = kx^2 - 5x + 7$. 22...............

23 Find the coordinates of the point of intersection of the graphs of $x - 2y + 7 = 0$ and $x + y + 1 = 0$. 23...............

24 Write an equation of the line which passes through the point $(3, -2)$ and which has the same slope as the line $3x + 4y + 5 = 0$. 24...............

25 Solve for x: $x^2 = 2x$ 25...............

Directions (26–30): Write on the line at the right of *each* of the following the *number* preceding the expression that best completes the statement or answers the question.

26 If k is a constant and zero is one root of the equation $3x^2 - 5x + k = 0$, the value of k must be

(1) zero
(2) 5
(3) 3
(4) any number except zero

26.....

27 The graph of the equation $y = (x + 2)^2$ is

(1) a straight line
(2) a circle
(3) an ellipse
(4) a parabola

27......

28 For which equation is the sum of the roots equal to $\frac{4}{3}$?

(1) $3x^2 + 4x + 5 = 0$
(2) $x^2 - 7x + 12 = 0$
(3) $3x^2 - 4x + 5 = 0$
(4) $x^2 + x + \frac{4}{3} = 0$

28......

29 If $y = 10^x$, then

(1) $y = \log_x 10$
(2) $y = \log_{10} x$
(3) $x = \log_{10} y$
(4) $x = \log_y 10$

29......

30 The expression $\frac{x^{\frac{1}{2}}}{x^{\frac{1}{4}}}$ is equivalent to

(1) $x^{\frac{1}{8}}$
(2) $x^{\frac{3}{4}}$
(3) $x^{\frac{1}{2}}$
(4) $x^{\frac{1}{4}}$

30......

Part II

Answer four questions from this part. Show all work unless otherwise directed. Only an algebraic solution will be accepted in question 32.

31 Solve *algebraically* the following set of equations and check in both equations: [8, 2]

$$x^2 + y^2 = 25$$
$$x - 2y + 5 = 0$$

32 A dealer paid $216 for a number of identical table radios. He sold all but two of them at a gain of $6 on the original cost of each. If he made a profit of $24 on the whole transaction, how many radios did he buy? [5, 5]

33 *a* Find in radical form the roots of $2x^2 + 6x - 9 = 0$. [5]

b Solve the equation and check the results: $2\sqrt{2x+3} + x = 1$ [5]

34 *a* Draw the graph of $y = x^2 - x - 4$ from $x = -2$ to $x = 3$, inclusive. [6]

b Write the equation of the axis of symmetry of this graph. [2]

c Using the graph drawn in answer to part *a*, estimate to *tenths* the roots of $x^2 - x - 4 = 0$. [2]

35 Given the formula $x^2 \sqrt[3]{g} = 100$. If $g = 32.20$, find by means of logarithms the positive value of x to *four significant digits.* [10]

36 Write the equations that would be used to solve the following problems. In each case state what the letter or letters represent. [*Solution of the equations is not required.*]

a A swimming pool has two inlet pipes. The smaller pipe alone can fill the pool in 20 hours; the larger, alone, in 6 hours. The larger pipe was turned on when the pool was empty, and two hours later the smaller pipe was also turned on. How many hours after the smaller pipe was turned on was the pool filled? [5]

b If 50 ounces of a mixture of tin and lead containing 20% tin is to be converted into a new mixture containing 50% tin, how many ounces of tin must be added to the original mixture? [5]

*37 Solve the equation $2x^3 - 5x^2 - x + 6 = 0$. [10]

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

FOR TEACHERS ONLY

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SCORING KEY

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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. Do not allow credit unless an equation is written in 20. For questions 26–30, allow credit if the pupil has written the correct answer instead of the number 1, 2, 3 or 4.

(1) $\frac{3-\sqrt{3}}{6}$

(2) $7i$

(3) $\frac{18x-27-2x^2}{2x(6x-9)}$

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

(5) 4

(6) .04224

(7) 9.6505 — 10

(8) $\frac{A^2}{B}$

(9) $\frac{1}{a-b}$

(10) $-\frac{a}{b}$

(11) $40a^8b^2$

(12) $3a-2b$

(13) 12

(14) 0

(15) 48

(16) 1

(17) $y=\frac{2}{3}x-4$

(18) $11a+20$

(19) $\left(\frac{3}{2}, 8\right)$

(20) $x=1$

(21) 67

(22) 3

(23) $(-3,2)$

(24) $3x+4y=1$

(25) 0, 2

(26) 1

(27) 4

(28) 3

(29) 3

(30) 4

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) (—5,0) and (3,4) [8]
Check [2]

(32) Analysis [5]
12 [5]

(33) *a* $\dfrac{-3 \pm 3\sqrt{3}}{2}$ [5]

b —1 [5]

(34) *b* $x = \frac{1}{2}$ [2]
c Allow 2.5, 2.6 *or* 2.7 and —1.7, —1.6 *or* —1.5 [2]

(35) 5.606 [10]

(36) *a* Let x = time the smaller pipe was open. $\dfrac{1}{6}(x+2) + \dfrac{1}{20}(x) = 1$ [5]

b Let x = amount of tin added. $\frac{1}{2}x + 25 = x + 10$ [5]

(37) —1, 2, $\dfrac{3}{2}$ [10]