

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

INTERMEDIATE ALGEBRA

Thursday, January 25, 1962 — 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 Find a value of x such that $2x^2 = x + 1$. 1.....
- 2 Find the numerical value of $5^0 + 2^{-1} + 8^{\frac{2}{3}}$. 2.....
- 3 Combine into a single fraction: $\frac{x}{x^2 - 4} - \frac{1}{x + 2}$ 3.....
- 4 Find the number whose logarithm is $9.4573 - 10$. 4.....
- 5 If $T = 16 \sin 26^\circ$, find the numerical value of $\log T$. 5.....
- 6 If $\log A = 2 \log B - \log C$, express A in terms of B and C . 6.....
- 7 Find the 25th term of the arithmetic progression $3, 5\frac{1}{2}, 8, \dots$ 7.....
- 8 The first three terms of a geometric progression are 4, 6 and 9. Find the fourth term. 8.....
- 9 Express as a quotient of two integers the sum of the infinite geometric progression $1, -0.1, 0.01, -0.001, \dots$ 9.....
- 10 Write the first three terms in the expansion of $(a + b)^{12}$. 10.....
- 11 The sum of the numbers r, s and t is 72. If $s = 2r$ and $t = 3s$, find the value of r . 11.....
- 12 The perimeter of a rectangle is represented by P and the width by w . Express the area in terms of P and w . 12.....
- 13 Write an equation of the line that passes through the point $(1, -2)$ and whose slope is $\frac{3}{8}$. 13.....
- 14 Find the value of k such that the line whose equation is $x - ky = 2$ will have a slope of 4. 14.....

INTERMEDIATE ALGEBRA -- *continued*

- 15 Factor: $6x^2 - 13x - 8$ 15.....
- 16 Write a quadratic equation, the sum of whose roots is 1 and the product of whose roots is -6 . 16.....
- 17 Write an equation of the axis of symmetry of the graph of the equation $y = x^2 - 4x$. 17.....
- 18 The pressure (P) exerted by the wind on the wall of a house varies directly as the square of the velocity (v) of the wind. If $P = 250$ when $v = 10$, find P when $v = 40$. 18.....
- 19 Which *one* of the four numbers $\sqrt{8}$, $\sqrt[3]{-8}$, $\sqrt{-8}$, -8 , is *not* a real number? 19.....
- 20 The point $(2, 6)$ lies on the graph of the equation $y = kx^2 - 3x$. Find the value of k . 20.....
- 21 If $x = 3 + \sqrt{2}$, find the value of $x^2 - 11$. 21.....
- 22 The dimensions of a rectangle are 8 and 18. Find to the *nearest degree* the angle which a diagonal makes with a side of length 18. 22.....

Directions (23-30): 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.

- 23 The reciprocal of $1 - \frac{1}{x}$ is
- (1) $\frac{1}{x} - 1$ (3) $\frac{x-1}{x}$
- (2) $1 - x$ (4) $\frac{x}{x-1}$ 23.....
- 24 When the product of $2.5(10)^4$ and $5.6(10)^2$ is written in the form $1.4(10)^n$, the value of n is
- (1) 5 (3) 7
- (2) 6 (4) 8 24.....
- 25 If $\log_{10} C = y$, then
- (1) $C = 10y$ (3) $C = y^{10}$
- (2) $C = 10^y$ (4) $C = \frac{10}{y}$ 25.....
- 26 Which value of k will make the roots of the equation $2x^2 - 4x + k = 0$ imaginary?
- (1) -2 (3) 3
- (2) 2 (4) -3 26.....

INTERMEDIATE ALGEBRA — *continued*

- 27 The equation $\sqrt{x} = x$ has two distinct roots. These roots are
- | | | |
|----------------|----------------|---------|
| (1) 1 and 0 | (3) 1 and -1 | 27..... |
| (2) -1 and 0 | (4) 4 and 2 | |
- 28 If the fraction $\frac{\sqrt{2}}{2}$ is expressed as an equivalent fraction with a rational numerator, the result is
- | | | |
|---------------------------|--------------------------|---------|
| (1) $\frac{1}{2\sqrt{2}}$ | (3) $\frac{1}{\sqrt{2}}$ | 28..... |
| (2) $\frac{2}{\sqrt{2}}$ | (4) $\frac{1}{2}$ | |
- 29 The graph of the equation $x^2 = y^2 + 4$ is
- | | | |
|----------------|-----------------|---------|
| (1) a circle | (3) a parabola | 29..... |
| (2) an ellipse | (4) a hyperbola | |
- 30 An illustration of the commutative law for addition is
- | | | |
|---------------------------------|---------------------------------|---------|
| (1) $2(a + b) = 2a + 2b$ | (3) $2a + 2b = 2b + 2a$ | 30..... |
| (2) $\frac{2a + 2b}{2} = a + b$ | (4) $a + (b + c) = (a + b) + c$ | |

Part II

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

31 Answer *both* *a* and *b*:

a Express in simplest radical form the roots of the equation $x^2 - 4x + 1 = 0$. [5]

b Solve the following system of equations: [5]

$$\begin{aligned} y &= x + 10 \\ y &= x^2 - 2x \end{aligned}$$

32 A math club and a science club contributed equal amounts to pay for a special program. Each math club member paid 50 cents. Since there were 5 more members in the math club than in the science club, each math club member paid 10 cents less than each science club member paid. Find the cost of the program. [*Only an algebraic solution will be accepted.*] [6, 4]

33 Given the formula $L = g\left(\frac{t}{\pi}\right)^2$. If $t = 0.75$, find by means of logarithms the value of L to the nearest integer. [Use the approximations $g = 981$ and $\pi = 3.14$.] [10]

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

b Using the letters *A* and *B*, label the points on the graph whose coordinates satisfy the following system of equations: [2]

$$\begin{aligned} y &= x^2 - 2x + 2 \\ y &= 6 \end{aligned}$$

c From the graph made in answer to part *a*, determine the smallest value of K for which the roots of $x^2 - 2x + 2 = K$ are real. [2]

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

a A motorboat travels 15 miles up a river and immediately returns to the starting point. The round trip takes 4 hours. If the rate of the motorboat in still water is 8 miles per hour, find the rate of the current of the river. [5]

b How many ounces of a 50% acid solution should be combined with 20 ounces of pure acid to change it to an 80% acid solution? [5]

*36 Answer *either* *a* or *b*:

a Solve and check the following system of equations: [8, 2]

$$\begin{aligned} a - 2b - 4c &= 6 \\ 3a + 2b + 2c &= 1 \\ 2a - b - 6c &= 4 \end{aligned}$$

OR

b Solve the equation $6x^3 - 7x^2 - x + 2 = 0$. [10]

* These questions are based on optional topics in the syllabus.

FOR TEACHERS ONLY

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INSTRUCTIONS FOR RATING

INTERMEDIATE ALGEBRA

Thursday, January 25, 1962 — 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. Do not allow credit unless an equation is written in 13, 16, 17. For questions 23–30, allow credit if the pupil has written the correct answer instead of the number 1, 2, 3 or 4.

- | | | |
|---|-------------------------|--------|
| (1) 1 or $-\frac{1}{2}$ | (15) $(2x + 1)(3x - 8)$ | (27) 1 |
| (2) $5\frac{1}{2}$ | (16) $x^2 - x - 6 = 0$ | (28) 3 |
| (3) $\frac{2}{x^2 - 4}$ | (17) $x = 2$ | (29) 4 |
| (4) 0.2866 | (18) 4,000 | (30) 3 |
| (5) 0.8459 | (19) $\sqrt{-8}$ | |
| (6) $\frac{B^2}{C}$ | (20) 3 | |
| (7) 63 | (21) $6\sqrt{2}$ or 8.5 | |
| (8) $13\frac{1}{2}$ | (22) 24 | |
| (9) $\frac{10}{11}$ | (23) 4 | |
| (10) $a^{12} + 12a^{11}b + 66a^{10}b^2$ | (24) 3 | |
| (11) 8 | (25) 2 | |
| (12) $\frac{w(P - 2w)}{2}$ | (26) 3 | |
| (13) $2x - 3y = 8$ | | |
| (14) $\frac{1}{4}$ | | |

[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) $a \ 2 + \sqrt{3}$ and $2 - \sqrt{3}$ [5]

$$\begin{array}{r|l|l} b \ x & 5 & -2 \\ \hline y & 15 & 8 \end{array} \quad [5]$$

(32) Analysis [6]

\$30 [4]

(33) 56 [10]

(34) $c \ 1$ [2]

(35) $a \ c =$ the rate of the current of the river

$$\frac{15}{8-c} + \frac{15}{8+c} = 4 \quad [5]$$

$b \ x =$ number of ounces of the 50% acid solution

$$.80(20 + x) = 20 + .50x \quad [5]$$

(36) $a \ a = 2$

$b = -3$

$c = \frac{1}{2}$ [8]

Check [2]

$b \ 1, \frac{2}{3}, -\frac{1}{2}$ [10]