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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ELEVENTH YEAR MATHEMATICS

Wednesday, August 12, 1970 — 12:30 to 3:30 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. Write your answers in the spaces provided on the separate answer sheet.

Directions (1–16): Write in the space provided on the separate answer sheet the *number* preceding the expression that best completes *each* statement or answers *each* question.

1 Given $h = \frac{t^2 + w^2}{3w}$. When $h = 5$ and $w = 2$, the positive value of t is

(1) $2\sqrt{13}$ (3) $\sqrt{26}$

(2) $2\sqrt{6}$ (4) 26

2 Which is the solution set pictured in the graph?

(1) $\{x \mid -1 \leq x \leq 2\}$
(2) $\{x \mid -1 \leq x < 2\}$
(3) $\{x \mid -1 < x < 2\}$
(4) $\{x \mid -1 < x \leq 2\}$

3 The fraction $\frac{\sqrt{3} - \sqrt{2}}{\sqrt{2}}$ is equivalent to

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

(2) $\frac{\sqrt{6} - 2}{2}$ (4) $\sqrt{3} - 1$

4 For all values of A for which the expression is defined, the product of $\tan A \cdot \cos A \cdot \csc A$ is equal to

(1) 1 (3) $\sin A$

(2) $\frac{1}{2}$ (4) $\frac{1}{\sin A}$

5 If $f(x) = x - 10$ and $g(x) = 10 - 2x$ and $f(x) = g(x) + 10$, then x is

(1) 1 (3) -1

(2) 10 (4) -10

6 A tank contains 20 pounds of salt water solution of which 6 pounds is salt. If x pounds of water are evaporated from this solution, what part of the remaining solution is salt?

(1) $\frac{6 - x}{20 - x}$ (3) $\frac{6}{20 - x}$

(2) $\frac{6}{20}$ (4) $\frac{6 - x}{20}$

7 A root of the quadratic equation $x^2 + 4 = 0$ is

(1) i (3) $1 - 2i$

(2) $2i$ (4) $4i$

8 For what value of x in the interval $180° \leq x \leq 360°$ is $\sin x = \cos x$?

(1) 180° (3) 270°

(2) 225° (4) 360°

9 Which ordered pair is in the intersection of $x - y = 2$ and $y^2 - 2x = 4$?

(1) (0,2) (3) (10,8)

(2) (−2,0) (4) (6,4)

10 If the replacement set is the set of real numbers, then the solution set for $|3x - 2| = 1$ is

(1) $\{1\}$ (3) $\{1, \frac{1}{3}\}$

(2) $\{\frac{1}{3}\}$ (4) $\{\ \}$

11 If the domain of $y = x + 2$ is the set of positive integers, then the range consists of

(1) only the positive integers greater than 2
(2) all the positive integers
(3) all the real numbers
(4) all the negative integers

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12 If x is a positive acute angle and $\tan x = R$, then $\cos x$ is equal to

(1) $\dfrac{R}{\sqrt{R^2 - 1}}$ (3) $\dfrac{1}{\sqrt{R^2 + 1}}$

(2) $\sqrt{R^2 - 1}$ (4) $\dfrac{1}{\sqrt{R^2 - 1}}$

13 If $\sin x = \frac{5}{13}$ and x is an angle in the first quadrant, the numerical value of $\sin (180° - x)$ is

(1) $\frac{12}{13}$ (3) $\frac{5}{13}$

(2) $-\frac{12}{13}$ (4) $-\frac{5}{13}$

14 A root of the equation $\cos x = -\dfrac{\sqrt{3}}{2}$ is

(1) 330° (3) 120°

(2) 150° (4) 60°

15 For all values of x for which the expression is defined, $\dfrac{2 \cos x}{\sin 2x}$ is equivalent to

(1) $\sin x$ (3) $2 \csc x$

(2) $2 \sin x$ (4) $\csc x$

16 Using the data $a = 18$, $b = 20$, and $A = 60°$, triangle ABC

(1) must be a right triangle
(2) must be an acute triangle
(3) must be an obtuse triangle
(4) may be either an acute or an obtuse triangle

17 Find the amplitude of the graph of $y = 3 \sin 2x$.

18 If 2.6×10^n is equal to 0.00026, what is the value of n?

19 What is the sum of the roots of the equation $2x^2 - 3x = 5$?

20 If $\tan \theta = \frac{1}{4}$, express θ in inverse trigonometric form.

21 Express $a^2 + a - 3(a + 1)$ as a product of two binomials.

22 If, in $\triangle ABC$, $\angle A = 45°$, $\angle B = 45°$, and $a = 3$, find the area of the triangle.

23 According to Boyle's law, the volume of a gas, at a constant temperature, varies inversely with pressure applied to it. If the volume of a gas is 120 cubic inches when the pressure is 30 pounds per square inch, find the volume in cubic inches when the pressure is 40 pounds per square inch.

24 In $\triangle ABC$, $a = \sqrt{2}$, $b = 3$, and $B = 45°$. Find the numerical value of $\sin A$.

25 Express in *simplest* form:

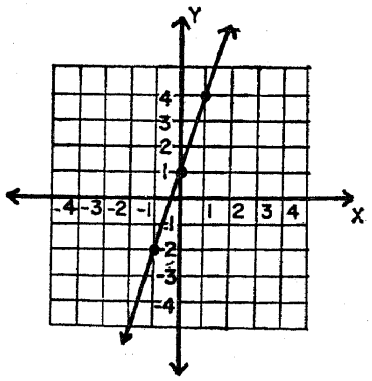
$$\frac{\dfrac{x}{y} + z}{\dfrac{x}{z} + y}$$

26 Solve for x: $2^x - 10 = 6$

27 Find the value of N to the *nearest hundredth*, when $\log N = 1.6697$.

28 In a circle with radius 2 inches, find the length of an arc, in inches, intercepted by a central angle of $2\frac{1}{2}$ radians.

29 Write an equation of the line drawn on the set of coordinate axes.



30 In triangle ABC, $a = 2$, $b = 3$, and $\cos C = \frac{1}{3}$. Find the value of c.

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 hundredth* the values of $\tan \theta$ in the solution set of $\{\tan \theta \mid 2 \tan^2 \theta = 5 - \tan \theta\}$. [8]

b Using the result found in part *a*, determine the number of values of θ in the interval $0° < \theta < 180°$ which satisfy $2 \tan^2 \theta = 5 - \tan \theta$. [2]

32 Solve the following system of equations and *check* your solutions in both equations: [8,2]

$$3x^2 - y^2 + 1 = 0$$
$$2x - y = 1$$

33 *a* On the same set of axes sketch the graphs of $y = \tan x$ and $y = 2 \cos x$ for values of x in the interval $0 \leq x \leq 2\pi$. [Label each curve with its equation.] [4,4]

b For how many values of x in the interval $0 \leq x \leq 2\pi$ is $y = 2 \cos x - \tan x$ undefined? [2]

34 *a* Starting with the formula for $\tan (x + y)$ derive the formula for $\tan 2x$. [3]

b For all values of x for which the expression is defined, show that the following equation is an identity: [5]

$$1 + \frac{1}{\cos x} = \frac{\tan^2 x}{\sec x - 1}$$

c For what value(s) of x in the interval $0 \leq x \leq \pi$ is the expression, $1 + \frac{1}{\cos x} = \frac{\tan^2 x}{\sec x - 1}$, *not* defined? [2]

35 A motorist can decrease by 2 hours the time it takes to travel 400 miles if he increases his average speed by 10 miles per hour. What was the motorist's original average speed in miles per hour? [*Only an algebraic solution will be accepted.*] [5,5]

36 Using logarithms, find to the *nearest degree* the value of x in the interval $0° < x < 90°$ if

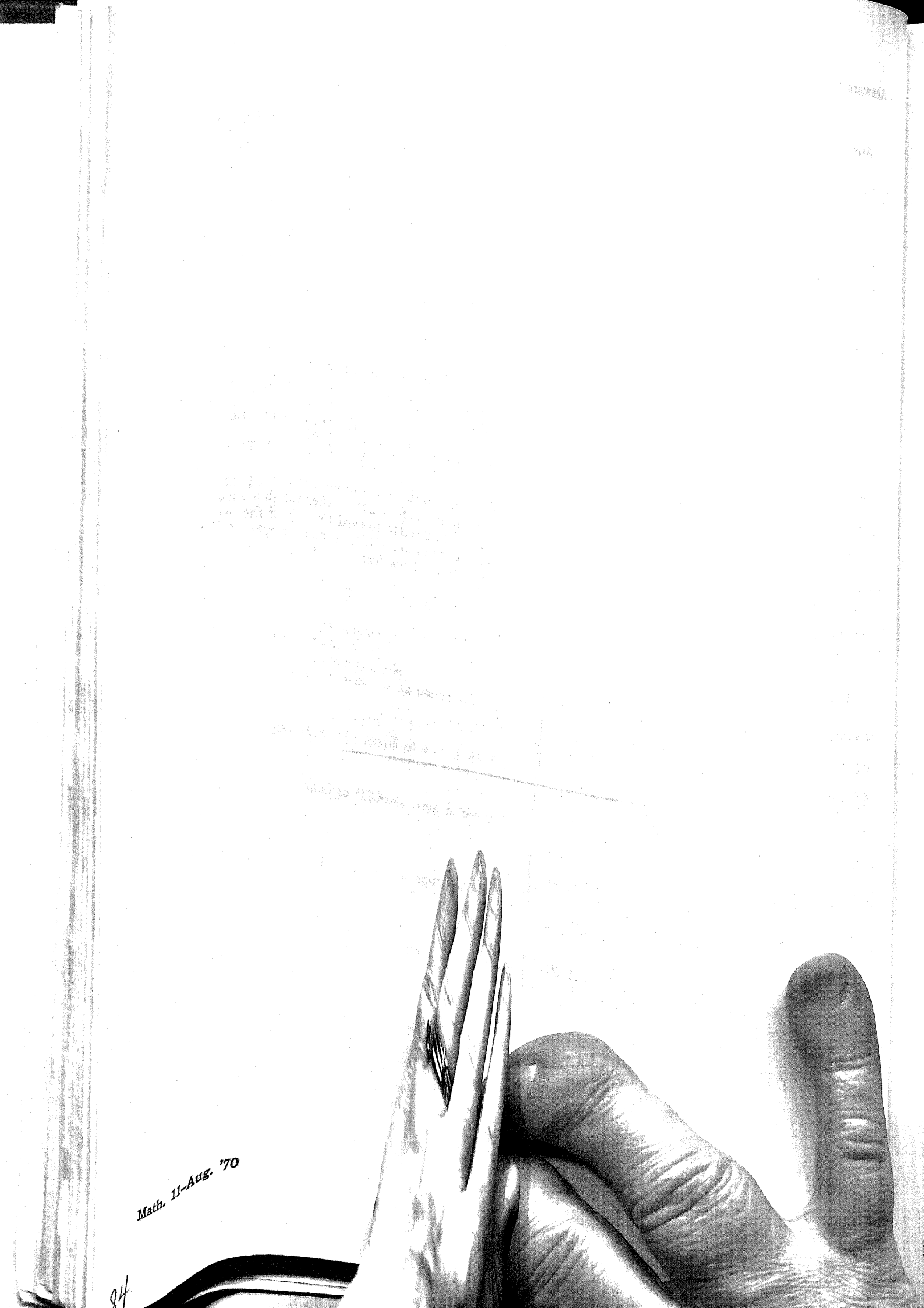
$$\tan x = \sqrt{\frac{(3.75)\ (2.05)}{(8.25)\ (2.45)}}\ .$$ [10]

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

a Two sides of a parallelogram have lengths of 22 and 29. The measure of one angle of the parallelogram is 12°. Find to the *nearest tenth* the length of the shorter diagonal. [4,6]

OR

b From a ship the angle of elevation of a point A at the top of a cliff is 21°. After the ship has sailed 1,250 feet directly toward the foot of the cliff, the angle of elevation is 47°. Find the height of the cliff to the *nearest ten feet*. [10]


Math. 11-Aug. '70

Part I Score:.....

Rater's Initials:

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ANSWER SHEET

Pupil..... Teacher.....

School.....

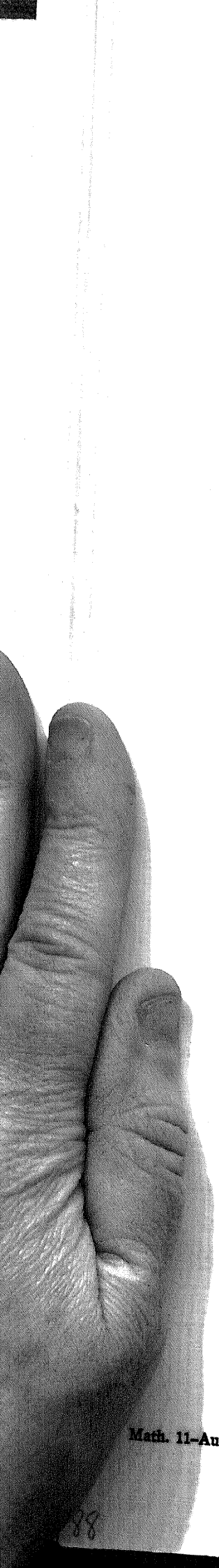
Your answers to Part I should be recorded on this answer sheet.

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.



FOR TEACHERS ONLY

11

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. For questions 1–16, allow credit if the pupil has written the correct answer instead of the number 1, 2, 3, or 4.

(1) 3

(2) 4

(3) 2

(4) 1

(5) 2

(6) 3

(7) 2

(8) 2

(9) 4

(10) 3

(11) 1

(12) 3

(13) 3

(14) 2

(15) 4

(16) 4

(17) 3

(18) -4

(19) $\frac{5}{2}$

(20) $\theta = \arctan \frac{1}{4}$

(21) $(a + 1)(a - 3)$

(22) $4\frac{1}{2}$

(23) 90

(24) $\frac{1}{3}$

(25) $\frac{z}{y}$

(26) 4

(27) 46.74

(28) 5

(29) $y = 3x + 1$

(30) 3

[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* 1.35, —1.85 [8]
b 2 [2]

(32) $x = 0, y = -1$
$x = 4, y = 7$ [8]

(33) *b* 2 [2]

(34) *c* $x = 0$,
$x = \frac{\pi}{2}$ [2]

(35) Analysis [5]
40 [5]

(36) 32 [10]

(37) *a* Analysis [4]
8.8 [6]
b 750 [10]

DO YOU KNOW...

. . . that most questions used on Regents examinations have been tried out in advance in representative classrooms throughout the State?

Each year more than 40,000 pupils in about 300 schools "pretest" questions intended for use in future Regents examinations. When committees of classroom teachers meet to assemble Regents examinations, the information obtained from this pretesting is to aid them in determining which questions are appropriate, which questions need revision, and which questions should be eliminated.

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