

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

ELEVENTH YEAR MATHEMATICS

Thursday, January 24, 1980 — 1:15 to 4:15 p.m., only

The last page of the booklet is the answer sheet. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

The "Reference Tables for Mathematics" which you may need to answer some questions in this examination are stapled in the center of this booklet.

When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer paper cannot be accepted if you fail to sign this declaration.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN

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 space provided on the separate answer sheet.

- 1 Simplify: $\frac{x^2 - 4x}{x^2 - 2x - 8}$
- 2 It took a sports reporter 3 hours and 15 minutes to drive 247 kilometers to Lake Placid. What was her average rate of speed in kilometers per hour for this trip?
- 3 If x varies directly as y and if $x = 6$ when $y = \frac{1}{2}$, find the value of x when $y = 3$.
- 4 Solve for R : $\frac{1}{R} = \frac{1}{2} + \frac{1}{3}$
- 5 Write an equation of the line which is perpendicular to $y = -\frac{3}{4}x + 7$ and which passes through the origin.
- 6 If $\cos A = \frac{5}{13}$ and $\tan A$ is negative, find the value of $\sin A$.
- 7 In $\triangle ABC$, $a = 1$, $b = 2$, and $\cos C = \frac{1}{2}$. Find the length of side c in radical form.
- 8 Express 165° in radian measure.
- 9 Solve the following system of equations for y in terms of a and b :
- $$\begin{aligned} x + y &= a \\ x - y &= b \end{aligned}$$
- 10 If $n = 7.21 \times 10^2$, what is the numerical value of $\log n$?
- 11 In $\triangle ABC$, $\sin A = 0.2$, $\sin B = 0.3$, and $a = 10$. What is the length of side b ?

Directions (12–30): Write in the space provided on the separate answer sheet the numeral preceding the expression that best completes each statement or answers each question.

- 12 What is the solution set of the inequality $3x + 1 \geq 11 - 2x$?
- (1) $\{x \leq -2\}$ (3) $\{x \geq -2\}$
 (2) $\{x \geq 2\}$ (4) $\{x > 0\}$
- 13 The expression $\sqrt{-8}$ is equivalent to
- (1) $i\sqrt{2}$ (3) $2i\sqrt{2}$
 (2) $2i$ (4) $4i\sqrt{2}$
- 14 The expression $\frac{6 \times 10^6}{3 \times 10^2}$ is equal to
- (1) 2×10^6 (3) 2×10^{-6}
 (2) 2×10^4 (4) 2×10^{-4}
- 15 Which equation is an illustration of the distributive law?
- (1) $a(b + c) = ab + ac$
 (2) $(a + b) + c = a + (b + c)$
 (3) $(ab)c = a(bc)$
 (4) $ab + ac = ac + ab$
- 16 What is the amplitude of the function $y = 3 \sin 2x$?
- (1) π (3) 3
 (2) 2 (4) $\frac{2\pi}{3}$
- 17 The graph of the equation $3y^2 = 6 - x^2$ is
- (1) a circle (3) a parabola
 (2) an ellipse (4) a hyperbola
- 18 If $\log_{10}(x + 5) = 1$, what is the value of x ?
- (1) 1 (3) 10
 (2) 5 (4) 0
- 19 One root of the equation $6x^2 - 11x + 5 = 0$ is 1. What is the other root?
- (1) $\frac{2}{5}$ (3) $\frac{4}{3}$
 (2) $\frac{1}{2}$ (4) $\frac{5}{6}$

20 Which statement is true concerning the graph of the equation $y = x$?

- (1) It is parallel to the x-axis.
(2) It is perpendicular to the x-axis.
(3) It has no slope.
(4) It passes through the origin.

21 If $f(x) = \frac{1}{2}(x - 3)^2$, the value of $f(3)$ is

- (1) 1 (3) 0
(2) $\frac{1}{2}$ (4) $\frac{9}{2}$

22 The value of $\sin(\text{Arc csc } 2)$ is

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

23 The prime factors of $2x^3 + x^2 - 6x$ are

- (1) $(2x^2 + 3x)(x - 2)$ (3) $x(2x + 3)(x - 2)$
(2) $x(2x - 3)(x + 2)$ (4) $x^2(2x + 1)(-6x)$

24 The expression $(\sqrt[3]{2})(\sqrt[3]{24})$ is equal to

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

25 The expression $\sin(-110^\circ)$ is equivalent to

- (1) $\sin 20^\circ$ (3) $-\sin 70^\circ$
(2) $\cos 20^\circ$ (4) $-\cos 70^\circ$

26 If $(x + 3) + (y + 2)i = 7 - 6i$, what is the value of x ?

- (1) 10 (3) -4
(2) 7 (4) 4

27 The numerical value of $\cot 330^\circ$ is

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

28 Which value of x satisfies the equation $2 \cos^2 x - 1 = 1$?


- (1) 0° (3) 45°
(2) 30° (4) 90°

29 The expression $\frac{\tan x}{\sec^2 x}$ is equivalent to

- (1) $\sin x$ (3) $\frac{\sin^3 x}{\cos x}$
(2) $\sin x \cos x$ (4) $\frac{\cos^3 x}{\sin x}$

30 The expression $\frac{1}{1 - \cos A} + \frac{1}{1 + \cos A}$ is equivalent to

- (1) $\frac{2}{1 + \cos A}$ (3) $\frac{2}{1 - \cos^2 A}$
(2) $\frac{2}{1 - \cos A}$ (4) $\frac{2 \cos A}{1 - \cos^2 A}$

 GO RIGHT ON TO THE NEXT PAGE.

Part II

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

- 31 *a* Find the *nearest tenth* the roots of the equation $4x^2 - 3x - 5 = 0$. [8]
b If $x = \sin \theta$, determine the quadrant(s) in which angle θ may lie. [2]
- 32 *a* On the same set of axes, sketch the graphs of $y = 2 \sin x$ and $y = \cos 2x$ for the values of x in the interval $0 \leq x \leq 2\pi$. [Label each graph with its equation.] [4,4]
b From the graphs sketched in part *a*, find one value of x in the interval $0 \leq x \leq 2\pi$ such that $2 \sin x > \cos 2x$. [2]
- 33 The perimeter of a rectangle is 28 centimeters. If the diagonal of the rectangle is 10 centimeters, find the number of centimeters in the length and width of the rectangle. [Only an algebraic solution will be accepted.] [4,6]
- 34 In triangular field RST , the length of \overline{RS} is 50 meters, the measure of angle RST is 142° , the length of \overline{ST} is 68 meters. Find the length of \overline{RT} to the *nearest meter*. [10]
- 35 *a* Starting with the formula for $\cos(x + y)$, derive the formula for $\cos 2x$ in terms of $\sin x$. [4]
b For all values of A for which the expressions are defined, prove that $(\sin A + 1)(\csc A - 1) = \cos A \cot A$ is an identity. [6]
- 36 *a* Solve for x : $4^{3x-1} = 32^x$ [3]
b If $n = \sqrt{\frac{A^2}{B \cos \theta}}$, write an equation for $\log n$ in terms of $\log A$, $\log B$, and $\log \cos \theta$. [4]
c Using logarithms, find n to the *nearest hundredth*, if $n = \sqrt[3]{432}$. [3]
- *37 *a* On the same set of axes, graph the following system of inequalities:

$$x^2 + y^2 < 16$$

$$y \geq x$$
 [8]
b Give the coordinates of one point in the graph of the solution set of the system in part *a*. [2]
- * This question is based on an optional topic in the syllabus.

FOR TEACHERS ONLY

SCORING KEY

11

ELEVENTH YEAR MATHEMATICS

Thursday, January 24, 1980 — 1:15 to 4:15 p.m., only

Use only *red* ink or *red* 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 12–30, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

- | | | |
|------------------------|---------|--------|
| (1) $\frac{x}{x+2}$ | (11) 15 | (21) 3 |
| (2) 76 | (12) 2 | (22) 3 |
| (3) 54 | (13) 3 | (23) 2 |
| (4) $\frac{6}{5}$ | (14) 1 | (24) 2 |
| (5) $y = \frac{4}{3}x$ | (15) 1 | (25) 3 |
| (6) $-\frac{12}{13}$ | (16) 3 | (26) 4 |
| (7) $\sqrt{3}$ | (17) 2 | (27) 4 |
| (8) $\frac{11\pi}{12}$ | (18) 2 | (28) 1 |
| (9) $\frac{a-b}{2}$ | (19) 4 | (29) 2 |
| (10) 2.8579 | (20) 4 | (30) 3 |

[OVER]

209

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.

$$(31) \ a \ 1.6, \ -.8$$

$$b \ \text{III and IV}$$

[8]

[2]

$$(36) \ a \ 2$$

[3]

$$b \ \frac{2 \log A - (\log B + \log \cos C)}{3}$$

[4]

$$c \ 7.56$$

[3]

$$(33) \ L = 8$$

$$W = 6$$

[4.6]

$$(34) \ 112$$

[10]