

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

ELEVENTH YEAR MATHEMATICS

Wednesday, August 16, 1972 — 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. 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.

Directions (1-19): Write in the space provided on the separate answer sheet the numeral preceding the expression that best completes each statement or answers each question.

1 If $a \neq 0$, $b \neq 0$, then $\frac{1}{a} - \frac{1}{b}$ is equivalent to

(1) $\frac{a-b}{ab}$ (3) $-\frac{a+b}{ab}$

(2) $\frac{b-a}{ab}$ (4) $\frac{ab}{a-b}$

2 The product of $\frac{5}{a-\sqrt{2}}$ and $\frac{6}{a+\sqrt{2}}$ is undefined if a equals

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

(2) 2 (4) 4

3 The numerical value of $\cos 65^\circ 25'$ is

(1) 0.4160 (3) 0.9020

(2) 0.4318 (4) 0.9094

4 The value of $\tan (\text{Arc sin } \frac{\sqrt{2}}{2})$ is

(1) 1 (3) -1

(2) $\sqrt{3}$ (4) $\frac{\pi}{4}$

5 Billy will be y years old 2 years from now. His age 7 years ago was

(1) $y - 5$ (3) $y - 2$

(2) $y - 7$ (4) $y - 9$

6 The sum of $\sec \pi$ and $\tan \frac{\pi}{2}$ is

(1) +1 (3) -1

(2) 0 (4) not defined

7 Which is the solution set of $x + 3 > x + 1$?

(1) $x > 0$ (3) ϕ

(2) $x < 0$ (4) all real numbers

8 Which is an example of an identity?

(1) $\sin(x+y) = \sin x + \sin y$

(2) $\sin \theta = 2 \sin \frac{1}{2}\theta$

(3) $\sin 2\theta = 2 \sin \theta \cos \theta$

(4) $\cos 2\theta = 2 \cos^2 \theta$

9 If the domain of x is the set of real numbers, then the solution set of $|x-3| < 0$ is

(1) $x > 3$

(2) $x > 3$ or $x < 3$

(3) the set of real numbers

(4) the empty set

10 The graph of the function $y = 2 \sin \frac{1}{2}x$ passes through the point whose coordinates are

(1) (0,2) (3) $(-\frac{\pi}{2}, 1)$

(2) (0,0) (4) $(\pi, 1)$

11 If $x + y = a$ and $x - y = b$, then y is equal to

(1) $\frac{a+b}{2}$ (3) $\frac{b-a}{2}$

(2) $\frac{a-b}{2}$ (4) $a-b$

12 If the graph of the equation $y = x^2 - 6x + 10$ is sketched, it will

(1) intersect the x -axis in 2 real points

(2) be tangent to the x -axis

(3) lie entirely below the x -axis

(4) lie entirely above the x -axis

13 Given the equation $\log_{10}(x^2 - 3x) = 1$. The positive value of x that satisfies this equation is

(1) 3.3

(2) 2

(3) 5

(4) 6.5

14 Given $m\angle A = 30$, $b = 12$, and $a = 6$, it is possible to construct

(1) no triangles

(2) two distinct triangles

(3) one oblique triangle, only

(4) one right triangle, only

15 In triangle ABC , $a = 3$, $b = 5$, and $c = 7$. What is the number of degrees in angle C ?

(1) 30

(2) 60

(3) 90

(4) 120

16 How many points do the graphs of $x^2 - y^2 = 16$ and $y = 5$ have in common?

- (1) 1 (3) 0
(2) 2 (4) 4

17 The expression $\sec 215^\circ$ is equivalent to

- (1) $\sec 35^\circ$ (3) $-\sec 35^\circ$
(2) $\csc 55^\circ$ (4) $-\sec 55^\circ$

18 Given the equation $x^2y = k$, y varies

- (1) directly as the square of x
(2) inversely as the square of x
(3) directly as x
(4) inversely as x

19 If $\tan x = 2$ and $\tan y = 1$, the value of $\tan(x + y)$ is

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

Directions (20-30): Write your answers in the spaces provided on the separate answer sheet.

20 Express $\sqrt{-25} - \sqrt{-9}$ as a monomial in terms of i .

21 A wheel rotates through $\frac{10\pi}{3}$ radians. Express this rotation in terms of degree measure.

22 Solve for x : $\frac{x-1}{x-2} = \frac{x-2}{x-1}$

23 If the fraction $\frac{0.00004}{0.002}$ is expressed as 2×10^n , what is the value of n ?

24 Solve for x : $2^{3x} + 5 = 13$

25 Factor: $x^2 + (a + b)x + ab$

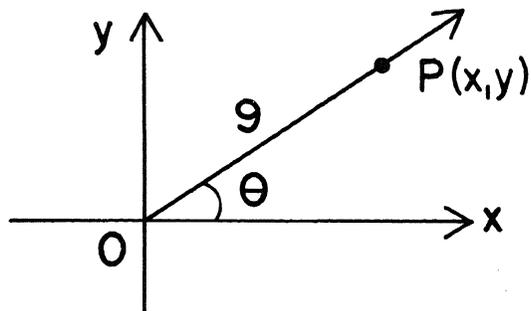
26 What is the slope of a straight line which is perpendicular to the line whose equation is $3x + y = 4$?

27 Find, in degrees, the smallest positive value of x that satisfies the equation $6 \cos x - 3 = 0$.

28 In triangle ABC , $a = 18$, $b = 14$, and $\sin A = 0.72$. Find $\sin B$ to the nearest hundredth.

29 One angle of a triangle is $41^\circ 20'$ and the sides which include this angle are 8 and 10. Find to the nearest integer the area of the triangle.

30 In the accompanying figure, $\cos \theta = \frac{2}{3}$ and $OP = 9$. What is the value of the x -coordinate of point P ?



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 values of $\tan x$ which satisfy the equation: [8]

$$\tan x + 3 \cot x = 5$$

- b How many values of x such that $180^\circ \leq x \leq 270^\circ$ satisfy the equation given in part a? [2]

- 32 a Starting with formulas for $\sin(x + y)$ and $\cos(x + y)$, derive a formula for $\tan(x + y)$ in terms of $\tan x$ and $\tan y$. [4]

- b Prove that the following is an identity for all values of x for which the expressions are defined: [6]

$$\frac{\tan x}{\csc x - \cot x} = \frac{1 + \cos x}{\cos x}$$

- 33 Using logarithms, find the value of P to the *nearest hundredth*. [10]

$$P = \frac{\sqrt[3]{0.361}}{4.23 (\sin 13^\circ)}$$

- 34 Solve the following system of equations and check in both: [8,2]

$$\begin{aligned} y^2 - 2x^2 &= 7 \\ 2x - y &= 1 \end{aligned}$$

- 35 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 A carpenter's helper requires 2 hours longer to do a certain job than it takes the carpenter. If the carpenter leaves after they have worked together on the job for 2 hours and the helper finishes the job in 1 more hour, how long would it take each of them to do the job alone? [5]

- b The units digit of a two-digit number exceeds the tens digit by 7. The number with the digits reversed is 5 more than three times the original number. Find the original number. [5]

- 36 a On the same set of axes, sketch the graphs of $y = \sin \frac{1}{2}x$ and $y = \cos 2x$ for all values of x in the interval $0 \leq x \leq 2\pi$. [4,4]

- b For how many values of x in the interval $0 \leq x \leq 2\pi$ does $\sin \frac{1}{2}x = \cos 2x$? [1]

- c What is the period of the graph of $y = \sin \frac{1}{2}x$? [1]

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

- a Two forces of 65.4 pounds and 35.2 pounds act on a body so that the angle between the resultant and the smaller force is $55^\circ 30'$. Find to the *nearest ten minutes* the angle between the two forces. [10]

OR

- b To measure the distance AB , a point C was chosen which was 8.0 feet from A and 12 feet from B . If the measure of angle ACB was 114° , find the distance AB to the *nearest foot*. [10]

FOR TEACHERS ONLY

11

SCORING KEY

ELEVENTH YEAR MATHEMATICS

Wednesday, August 16, 1972—12:30 to 3:30 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 1–19, allow credit if the pupil has written the correct answer instead of the number 1, 2, 3, or 4.

(1) 2	(11) 2	(21) 600
(2) 3	(12) 4	(22) $1\frac{1}{2}$
(3) 1	(13) 3	(23) -2
(4) 1	(14) 4	(24) 1
(5) 4	(15) 4	(25) $(x + a)(x + b)$
(6) 4	(16) 2	(26) $\frac{1}{3}$
(7) 4	(17) 3	(27) 60
(8) 3	(18) 2	(28) 0.56
(9) 4	(19) 3	(29) 26
(10) 2	(20) $2i$	(30) 6

[OVER]

ELEVENTH YEAR MATHEMATICS — *concluded*

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 4.3, 0.7 [8]
 b 2 [2]

(36) b 3 [1]
 c 4π [1]

(33) 0.75 [10]

(37) a $81^{\circ}50'$ [10]
 OR

(34) (3,5) [8]
 (-1,-3)

b 17 [10]

(35) a x = time for the carpenter

$$\frac{2}{x} + \frac{3}{x+2} = 1 \quad [5]$$

b u = units digit; t = tens digit

$$u = t + 7$$

$$10u + t = 3(10t + u) + 5 \quad [5]$$

DO YOU KNOW . . .

Who writes the questions used on Regents examinations?

- 1 the members of the Board of Regents
- 2 the subject supervisors in the State Education Department
- 3 college professors in the various disciplines
- 4 classroom teachers from schools throughout New York State

The correct answer is 4. Last year more than 400 classroom teachers were involved in the preparation of Regents examination questions, and many other teachers served on the committee that assembled the examinations.