

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE III

Tuesday, January 28, 1992 — 9:15 a.m. to 12:15 p.m., only

Notice . . .

If your school allows the use of calculators for this examination, they may be used for checking purposes **only**. In Part II, all work, including calculations, must be shown on your answer paper.

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” and a formula sheet which you may need to answer some questions in this examination are stapled in the center of this booklet. Open the booklet and carefully remove the reference tables.

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

Part I

Answer 30 questions from 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. Where applicable, answers may be left in terms of π or in radical form. [60]

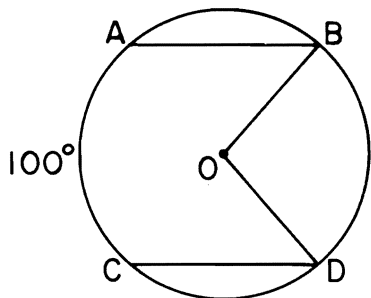
1 In $\triangle ABC$, $a = 5$, $\sin A = 0.35$, and $\sin B = 0.21$. Find the measure of side b .

2 Find the area of $\triangle ABC$ if $a = 8$, $b = 10$, and $m\angle C = 30$.

3 Express 210° in radian measure.

4 Evaluate: $\cos [\text{Arc sin } (-1)]$

5 In the accompanying diagram of circle O , chord \overline{AB} is parallel to chord \overline{CD} . If $m\widehat{AC} = 100$, find $m\angle BOD$.



6 Evaluate: $\sum_{k=2}^4 (2k + 1)^2$

7 In a circle of radius 9, find the number of radians in a central angle that intercepts an arc of 18.

8 Find the positive value of x if $|4 - 2x| = 6$.

9 Simplify: $\frac{\frac{2}{x} - 2}{\frac{1-x}{x}}$

10 Express $\tan 240^\circ$ as a function of a positive acute angle.

11 Solve for x : $\left(\frac{1}{2}\right)^x = 4$

12 A biased coin is tossed. The probability of getting a head is $\frac{5}{8}$. What is the probability that no heads will occur in two tosses of the coin?

13 Find the image of the point $(6, -2)$ under the rotation R_{90° about the origin.

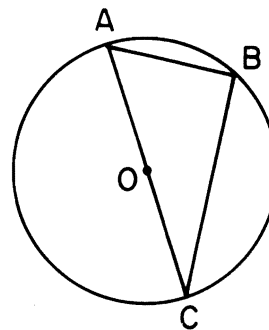
14 If $\sin A = \frac{5}{13}$, find $\cos 2A$.

15 If x varies inversely as y and $x = 2.5$ when $y = 40$, find y when $x = 2$.

16 Express $\frac{3}{5 - 2\sqrt{3}}$ as a fraction with a rational denominator.

Directions (17–35): For each question chosen, write on the separate answer sheet the numeral preceding the word or expression that best completes the statement or answers the question.

17 In the accompanying diagram of circle O , the ratio of \widehat{BC} to \widehat{AB} is 2:1.



What is $m\angle ACB$?

- (1) 30 (3) 60
(2) 45 (4) 90

18 What is a logarithmic equation for the formula

$$t = \pi \sqrt{\frac{\ell}{g}}$$

- (1) $\log t = \frac{\log \pi + \log \ell - \log g}{2}$
 (2) $\log t = \log \pi + \frac{1}{2}(\log \ell - \log g)$
 (3) $\log t = \log \pi + 2(\log \ell - \log g)$
 (4) $\log t = \log \pi + \frac{1}{2} \log \ell - \log g$

19 If $\cos A = -\frac{4}{5}$ and $\tan A$ is negative, in which quadrant does angle A terminate?

- (1) I (3) III
 (2) II (4) IV

20 What are the sum (s) and the product (p) of the roots of the equation $x^2 + 2x - 35 = 0$?

- (1) $s = 2, p = -35$ (3) $s = -2, p = -35$
 (2) $s = -35, p = 2$ (4) $s = 35, p = -2$

21 The expression $\sec^2 \theta + \csc^2 \theta$ is equivalent to

- (1) $1 - \tan^2 \theta$ (3) $\frac{1}{\sin^2 \theta \cos^2 \theta}$
 (2) $1 + \tan^2 \theta$ (4) $\sin^2 \theta \cos^2 \theta$

22 If A and B are acute angles, $\sin A = \frac{1}{2}$, and $\sin B = \frac{\sqrt{3}}{2}$, what is the value of $\sin(A - B)$?

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

23 An equation of a hyperbola is

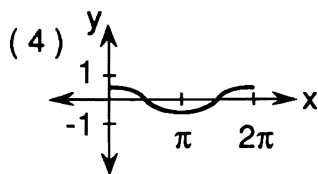
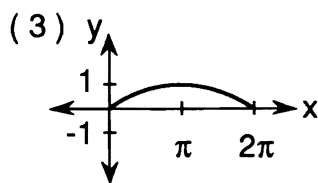
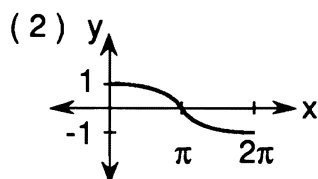
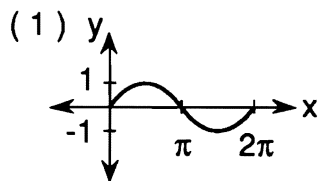
- (1) $x + y = 16$ (3) $x^2 - y^2 = 16$
 (2) $x^2 + y^2 = 16$ (4) $2x^2 + y^2 = 16$

24 When combined, $\frac{2}{x+3} + \frac{1}{x}$ is equivalent to

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

25 Which graph represents the equation

$$y = \frac{1}{2} \cos x?$$



26 If $\log_x 9 = \frac{1}{2}$, what is the value of x ?

- (1) $4\frac{1}{2}$ (3) 3
 (2) 27 (4) 81

27 Which set does *not* form a field with the operations of addition and multiplication?

- (1) complex numbers (3) integers
 (2) rational numbers (4) real numbers

28 On a standardized test, the mean is 37 and the standard deviation is 2.5. Approximately what percent of the scores fall in the range 32-42?

- (1) 34% (3) 95%
 (2) 68% (4) 99%

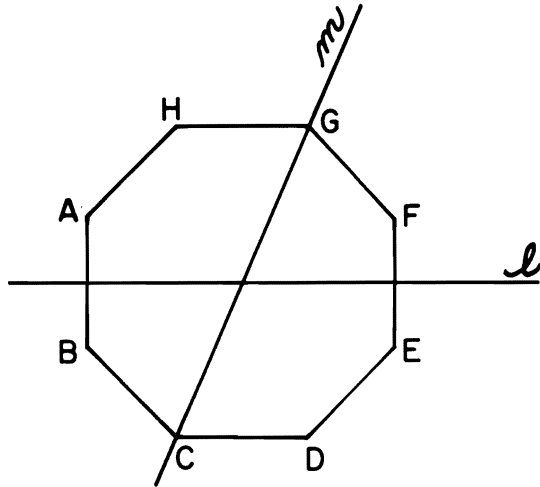
29 If $h(x) = x^2$ and $i = \sqrt{-1}$, then $h(2i)$ equals

- (1) $4i$ (3) $-4i$
 (2) -4 (4) 4

30 The domain of the function $f(x) = \frac{3}{\sqrt{x-1}}$ is

- (1) $\{x|x \neq 1\}$ (3) $\{x|x < 1\}$
 (2) $\{x|x \geq 1\}$ (4) $\{x|x > 1\}$

31 In the accompanying diagram, ℓ and m are symmetry lines for regular octagon $ABCDEFGH$.



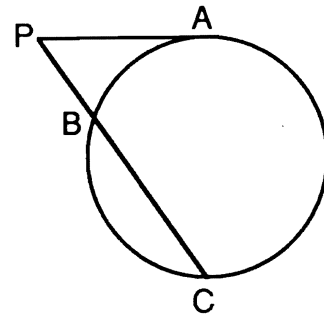
What is $r_\ell \circ r_m(F)$?

- (1) A (3) C
 (2) B (4) D

32 For which value of k will the roots of the equation $2x^2 - 4x + k = 0$ be real and equal?

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

33 In the accompanying diagram, \overrightarrow{PA} is tangent to the circle at A and \overline{PBC} is a secant. If $PA = 2\sqrt{3}$ and $PB = 2$, what is PC ?



- (1) 6 (3) 5
 (2) 2 (4) 4

34 If $m\angle A = 35$, $a = 7$, and $b = 10$, how many distinct triangles can be formed?

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

35 The third term of $(x - y)^5$ is

- (1) $28x^6y^2$ (3) $56x^6y^2$
 (2) $-28x^6y^2$ (4) $-56x^5y^3$

Answers to the following questions are to be written on paper provided by the school.

Part II

Answer four questions from this part. All work, including calculations, must be shown on your answer paper. [40]

36 a On the same set of axes, sketch the graphs of the equations $y = 2 \cos \frac{1}{2}x$ and $y = -\sin x$ in the interval $0 \leq x \leq 2\pi$. [8]

b From the graphs drawn in part a, find all values of x that satisfy the equation $2 \cos \frac{1}{2}x = -\sin x$. [2]

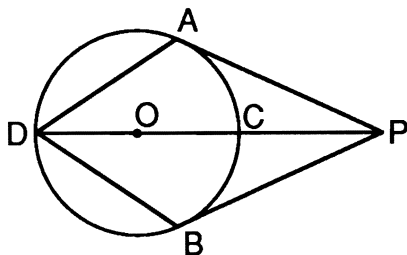
37 a To the nearest ten minutes, find all values of x in the interval $0^\circ \leq x < 360^\circ$ that satisfy the equation $3 \tan^2 x + 5 \tan x - 2 = 0$. [6]

b For all values of A for which the expressions are defined, show that the following is an identity:

$$\sin 2A \sec^2 A = 2 \tan A \quad [4]$$

38 In parallelogram $ABCD$, $AD = 10$, $AB = 12$, and diagonal $BD = 18$. Find the measure of angle A to the nearest ten minutes. [10]

39 Given: circle O with tangents \overline{PA} and \overline{PB} , secant \overline{PCOD} , chords \overline{AD} and \overline{DB} , and $\widehat{AD} \cong \widehat{DB}$.



a Prove: $\angle APD \cong \angle BPD$ [6]
 b If $m\widehat{AD} = 110$, find $m\angle DBP$. [4]

40 a Solve for x :

$$\frac{x}{x-1} + \frac{2}{x^2-1} = \frac{8}{x+1} \quad [5]$$

b Using logarithms, find x to the nearest tenth:

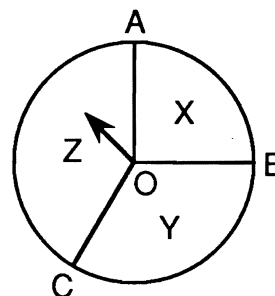
$$3^x = 16 \quad [5]$$

41 a Sketch the graph of $xy = 8$ from $x = -8$ to $x = 8$. [4]

b On the same set of axes, reflect the graph drawn in part a in the x -axis and label it b . [4]

c Write an equation of the function graphed in part b. [2]

42 In the accompanying diagram, the spinner is in circle O , which is divided into three areas: X , Y , and Z . In the circle, $m\angle AOB = 90^\circ$, $m\angle BOC = 120^\circ$, and $m\angle AOC = 150^\circ$.



a If the spinner is spun once, find the probability that it will land in

- (1) area X [1]
- (2) area Y [1]
- (3) area Z [1]

b If the spinner is spun four times, find the probability that it will land in

- (1) area X exactly two times [3]
- (2) area Y at least three times [4]

FOR TEACHERS ONLY

SCORING KEY

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COURSE III

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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. Units need not be given when the wording of the questions allows such omissions.

Part I

Allow a total of 60 credits, 2 credits for each of 30 of the following. [If more than 30 are answered, only the first 30 answered should be considered.] Allow no partial credit. For questions 17–35, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 3	(11) -2	(21) 3	(31) 3
(2) 20	(12) $\frac{9}{64}$	(22) 4	(32) 2
(3) $\frac{7\pi}{6}$	(13) (2,6)	(23) 3	(33) 1
(4) 0	(14) $\frac{119}{169}$	(24) 1	(34) 2
(5) 100	(15) 50	(25) 4	(35) 1
(6) 155	(16) $\frac{3(5 + 2\sqrt{3})}{13}$	(26) 4	
(7) 2	(17) 1	(27) 3	
(8) 5	(18) 2	(28) 3	
(9) 2	(19) 2	(29) 2	
(10) $\tan 60^\circ$	(20) 3	(30) 4	

SEQUENTIAL MATH — COURSE III — *concluded*

Part II

Please refer to the Department publication *Guide for Rating Regents Examinations 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.

(36) $b \pi$ [2]

(41) $c \ xy = -8$ [2]

(37) $a \ 18^\circ 30', 116^\circ 30',$
 $198^\circ 30', 296^\circ 30'$ [6]

(42) $a \ (1) \ \frac{1}{4}$ [1]

(2) $\frac{1}{3}$ [1]

(38) $109^\circ 30'$ [10]

(3) $\frac{5}{12}$ [1]

(39) $b \ 125$ [4]

$b \ (1) \ \frac{54}{256}$ [3]

(2) $\frac{9}{81}$ [4]

(40) $a \ 2, 5$ [5]
 $b \ 2.5$ [5]

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