The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE III

Friday, January 26, 2001 — 9:15 a.m. to 12:15 p.m., only

Notice . . .

Scientific calculators must be available to all students taking this examination.

The formulas which you may need to answer some questions in this examination are found on page 2. 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.

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.

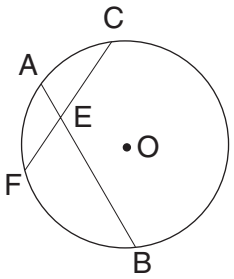
Part I

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 If $25 - 3^2 = 2^x$, what is the value of x?

2 If $f(x) = \tan x$, evaluate $f\left(\frac{\pi}{4}\right)$.

3 In the accompanying diagram of circle O, chords $\overline{AB}$ and $\overline{CF}$ intersect at E. If $EB = 16$, $AE = 5$, and $CE = 10$, find EF.



4 If θ is a positive acute angle and $2\cos\theta + 3 = 4$, find the number of degrees in θ.

5 Solve for x: $5 + \sqrt{3x-2} = 9$

6 If $f(x) = \frac{2}{\sqrt{5-x^2}}$ and $g(x) = x + 1$, evaluate $(f \circ g)(0)$.

7 In which quadrant are both tangent and cosecant negative?

8 Evaluate: $\sum_{k=1}^{4} 2^{k-1}$

9 In $\triangle FUN$, $f = 4$, $m\angle F = 26$, and $m\angle N = 67$. Find the value of n to the *nearest integer*.

10 If the probability of a team winning any game is $\frac{2}{3}$, find the probability that the team would win *exactly* four games in a five-game series.

11 Factor completely: $3t^3 + 5t^2 - 12t$

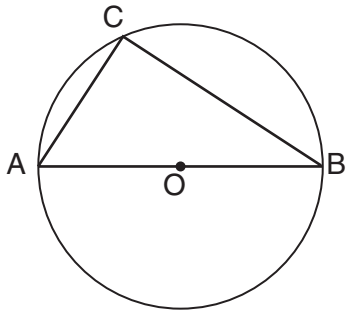
12 If the coordinates of B are $(1,-5)$, what are the coordinates of B', the image of B after $R_{90} \circ r_{x\text{-axis}} B$?

13 Express the sum of $2\sqrt{-50}$ and $6\sqrt{-162}$ as a monomial in terms of i.

14 Find the value of $\sin\left(\text{Arc}\cos\frac{8}{17}\right)$.

Directions (15–35): 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.

15 In the accompanying diagram, $\triangle ABC$ is inscribed in circle O and $\overline{AB}$ is a diameter.



What is the number of degrees in $m\angle C$?

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

16 The expression $\frac{1}{1-\tan x}$ is undefined when x equals

(1) 0°
(2) 30°
(3) 45°
(4) 60°

17 If $f(x) = x^{-\frac{2}{3}}$, what is f(8)?

(1) $-\frac{16}{3}$ (3) $\frac{1}{4}$

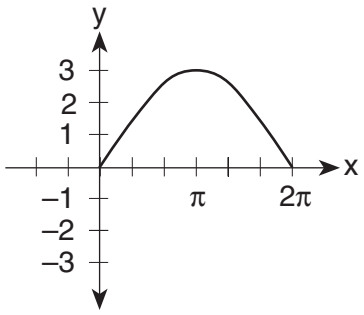
(2) -4 (4) 4

18 Expressed in simplest form, $\frac{5x + 3}{x} - \frac{x - 1}{2x}$ is

(1) $\frac{4x + 4}{3x}$ (3) $\frac{9x + 7}{2x}$

(2) $\frac{2x + 2}{x}$ (4) $\frac{9x - 5}{2x}$

19 Which equation is represented by the graph in the accompanying diagram?



(1) $y = 3 \sin 2x$ (3) $y = 2 \sin 3x$

(2) $y = 3 \sin \frac{1}{2}x$ (4) $y = \frac{1}{2} \sin 3x$

20 Which expression is *not* equivalent to sin 150°?

(1) sin 30° (3) cos 60°

(2) –sin 210° (4) –cos 60°

21 If placed in standard position, an angle of $\frac{11\pi}{6}$ radians has the same terminal side as an angle of

(1) –150° (3) –30°

(2) 150° (4) 240°

22 The expression (tan θ)(csc θ) is equivalent to

(1) cos θ (3) csc θ

(2) sec θ (4) csc θ cot θ

23 Which value of c will make the roots of the equation $x^2 - 8x + c = 0$ real and equal?

(1) –16 (3) 0

(2) –4 (4) 16

24 The expression $\log \frac{\sqrt{xy}}{w}$ is equivalent to

(1) $\frac{2 \log xy}{\log w}$

(2) $\log x + \log y - \log w$

(3) $\frac{1}{2}(\log x + \log y) - \log w$

(4) $\frac{1}{2}(\log xy - \log w)$

25 What is the range of the function $y = 2 \sin 3x$?

(1) all real numbers (3) $-2 \le y \le 2$

(2) $-1 \le y \le 1$ (4) $-3 \le y \le 3$

26 The expression $\frac{\frac{2x}{x+1}}{1-\frac{x}{x+1}}$ is equivalent to

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

(2) –2 (4) $2x$

27 If the vertex angle of an isosceles triangle measures 30° and each leg measures 4, the area of the triangle is

(1) $8\sqrt{3}$ (3) $4\sqrt{3}$

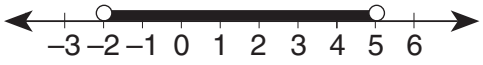
(2) 8 (4) 4

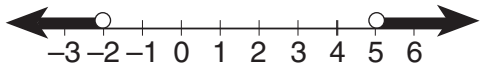
28 The expression $\frac{5}{4 + 3i}$ is equivalent to

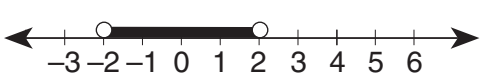
(1) $\frac{4 - 3i}{5}$ (3) $\frac{20 + 15i}{7}$

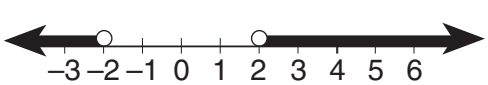
(2) $\frac{4 + 3i}{5}$ (4) $\frac{20 - 15i}{7}$

29 Which graph represents the solution to the inequality $|3 - 2x| > 7$?

(1)


(2)


(3)


(4)


30 The graph of the equation $y = 3 \cos x$ is symmetric with respect to the

(1) x-axis
(2) y-axis
(3) origin
(4) line $y = x$

31 The average score for a Latin test is 77 and the standard deviation is 8. Which percent best represents the probability that any one student scored between 61 and 93 on the test?

(1) 95%
(2) 99.5%
(3) 68%
(4) 34%

32 The graph of the equation $\frac{x}{2} = \frac{3}{y}$ is

(1) a circle
(2) an ellipse
(3) a hyperbola
(4) a line

33 What is the third term in the expansion of $(2x - y)^3$?

(1) $6xy^2$
(2) $2xy^2$
(3) $-2xy^2$
(4) $-6xy^2$

34 What is the period of the equation $y = -4 \cos 2x$?

(1) π
(2) 2π
(3) -4π
(4) -2

35 If $a = 5$, $c = 4$, and $m\angle A = 40$, then which type of triangle, if any, can be constructed?

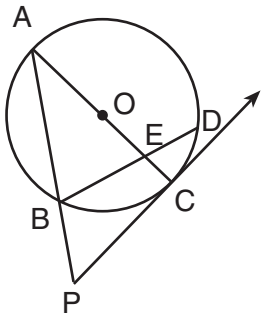
(1) a right triangle, only
(2) an acute triangle, only
(3) an obtuse triangle, only
(4) no triangle

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

Part II

Answer four questions from this part. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Calculations that may be obtained by mental arithmetic or the calculator do not need to be shown. [40]

36 In the accompanying diagram of circle O, $\overline{AOEC}$ is a diameter, $\overrightarrow{PC}$ is a tangent, $\overline{PBA}$ is a secant, $\overline{BED}$ is a chord, $AO = 8$, and $m\overset{\frown}{AB}:m\overset{\frown}{BC}:m\overset{\frown}{CD}:m\overset{\frown}{DA} = 3:2:1:4$.



Find:

a $m\overset{\frown}{BC}$ [2]

b $m\angle P$ [2]

c $m\angle BEC$ [2]

d AP to the *nearest tenth* [4]

37 *a* On graph paper, sketch and label the graph of the equation $y = \cos 2x$ in the interval $-\pi \le x \le \pi$. [4]

b On the same set of axes, sketch the reflection of $y = \cos 2x$ in the x-axis and label the image b. [2]

c Write an equation of the graph drawn in part b. [2]

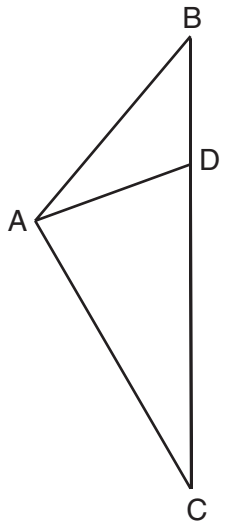
d Using the graphs drawn in parts a and b, determine one value of x that satisfies both equations. [2]

38 *a* Sketch and label the graph of the equation $y = 3^x$. [4]

b On the same set of axes, sketch the inverse of $y = 3^x$ and label the image b. [4]

c Write the equation of the graph sketched in part b. [2]

39 In the accompanying diagram of $\triangle ABC$, $AB = 12$ feet, $DC = 17$ feet, $m\angle ABD = 40$, and $m\angle ADB = 110$. Find AC to the *nearest foot*. [10]



40 Find, to the *nearest ten minutes* or *nearest tenth of a degree*, all values of x in the interval $0° \le x < 360°$ that satisfy the equation $4 \sin^2 x - 5 \sin x - 6 = 0$. [10]

41 *a* Express in simplest form:

$$\frac{x^2 - 9}{2x - 8} \div \frac{3 - x}{x - 4}$$ [4]

b In simplest form, express $\frac{x + y^{-1}}{y + x^{-1}}$ with no negative exponents. [3]

c Solve for x to the *nearest hundredth:* $2^x = 28$ [3]

42 *a* Mel took 12 tests in Sequential Math III and received the following grades:

85, 89, 89, 89, 90, 90, 90, 92, 92, 96, 96, 100

(1) Find, to the *nearest tenth*, the standard deviation. [4]

(2) What percent of the test grades are *more than* one standard deviation above the mean? [2]

b In a baseball game, the probability that Peter gets on base safely is $\frac{3}{7}$. If he comes to bat four times, what is the probability that he will get on base safely *at least* three times? [4]

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

SEQUENTIAL MATH – COURSE III

Friday, January 26, 2001 — 9:15 a.m. to 12:15 p.m., only

Part I Score	. . . . .
Part II Score	. . . . .
Total Score	. . . . .
Rater's Initials:	. . . . .

ANSWER SHEET

Pupil . . . . . Sex: ☐ Male ☐ Female Grade . . . . .

Teacher . . . . . School . . . . .

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

Part I

Answer 30 questions from this part.

1	11	21	31 . . . . .
2	12	22	32 . . . . .
3	13	23	33 . . . . .
4	14	24	34 . . . . .
5	15	25	35 . . . . .
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.

The declaration below should be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination and that I have neither given nor received assistance in answering any of the questions during the examination.

Signature

Tear Here

Tear Here

Tear Here

FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE III

Friday, January 26, 2001 — 9:15 a.m. to 12:15 p.m., only

SCORING KEY

Use only *red* ink or *red* pencil in rating Regents papers. Do not attempt to *correct* the student's work by making insertions or changes of any kind. Use checkmarks to indicate student 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 15–35, allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 4

(2) 1

(3) 8

(4) 60

(5) 6

(6) 1

(7) IV

(8) 15

(9) 8

(10) $\frac{80}{243}$

(11) $t(3t - 4)(t + 3)$

(12) (–5,1)

(13) $64i\sqrt{2}$

(14) $\frac{15}{17}$

(15) 4

(16) 3

(17) 3

(18) 3

(19) 2

(20) 4

(21) 3

(22) 2

(23) 4

(24) 3

(25) 3

(26) 4

(27) 4

(28) 1

(29) 2

(30) 2

(31) 1

(32) 3

(33) 1

(34) 1

(35) 3

[OVER]

Part II

Please refer to the Department's publication *Guide for Rating Regents Examinations in Mathematics,* 1996 Edition. 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) *a* 72 [2]
b 54 [2]
c 108 [2]
d 19.8 [4]

(37) *c* $y = -\cos 2x$ [2]
d $\frac{3\pi}{4}$ *or* $-\frac{3\pi}{4}$ *or* $\frac{\pi}{4}$ *or* $-\frac{\pi}{4}$ [2]

(38) *c* $x = 3^y$ *or* $\log_3 x = y$ [2]

(39) 16 [10]

(40) 228°40' and 311°20'
or [10]
228.6° and 311.4°

(41) *a* $\frac{-(x+3)}{2}$ [4]

b $\frac{x}{y}$ [3]

c 4.81 [3]

(42) *a* (1) 3.9 [4]
(2) 25% [2]

b $\frac{513}{2401}$ [4]